SAN DIEGO AREA

REGIONAL STANDARD DRAWINGS

STANDARD DRAWINGS FOR AGENCIES IN THE SAN DIEGO REGION

Recommended by the Regional Standards Committee
Maintained and Published by the San Diego County Department of Transportation
December, 1975

SAN DIEGO AREA

REGIONAL STANDARD DRAWINGS

STANDARD DRAWINGS FOR AGENCIES IN THE SAN DIEGO REGION

Recommended by the Regional Standards Committee

Maintained and Published by the San Diego County Department of Transportation
December, 1975

Regional Standards Committee

December, 1975

These standard drawings have been prepared and adopted by the San Diego Regional Standards Committee for the benefit of all agencies in the San Diego area. The Regional Standards Committee membership is comprised of the County's thirteen cities, the County of San Diego, various representative water districts and private industry organizations, the Pacific Telephone Company and the San Diego Gas and Electric Company. The San Diego County Department of Transportation is currently providing coordination and staff support for the Regional Standards Committee.

REVISIONS

The Regional Standards Committee will continuously accept proposed revisions and/or proposed new standard drawings for review. They should be submitted to the Regional Standards staff at the County Department of Transportation. The staff will assign the proposed revision a number and make any necessary preparations to ready the revision for presentation to the Regional Standards Committee. The staff will acknowledge receipt of all proposals in writing. Should the proposed revision be very minor in nature, ie., a grammatical error, etc., the staff will make the necessary change without taking it to the Regional Standard Committee. Once enough proposals have been submitted to warrant a Regional Standards Committee meeting, the staff will prepare an agenda and schedule a meeting.

At the meeting the Committee will take one of three possible actions: approve the change, reject the change or recommend that a subcommittee further study the change and make recommendations to the Committee. The individual or organization who submitted the change will then be notified in writing of the Committee action. After approval of the proposed change by the Regional Standards Committee the staff will print and distribute the change to the governmental agencies within San Diego County.

It is intended that the standard drawing package will be reprinted and distributed periodically incorporating all the changes approved by the Regional Standards Committee since the last printing. The reprinting will take place when the Regional Standards Committee determines enough revisions have been approved to warrant issuance of an updated drawing package.

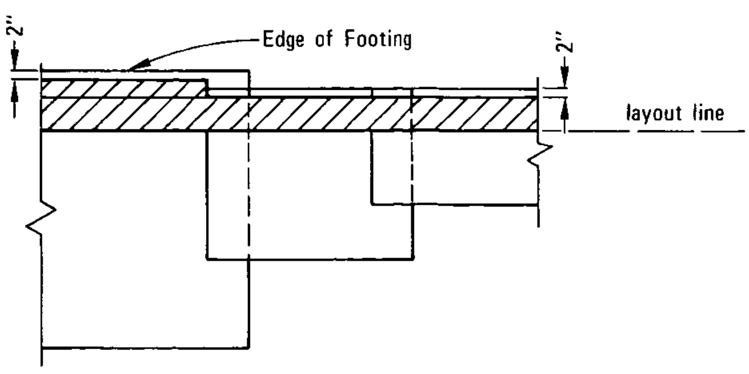
John P. Snodgrass

JOHN P. SNODGRASS
Chairman

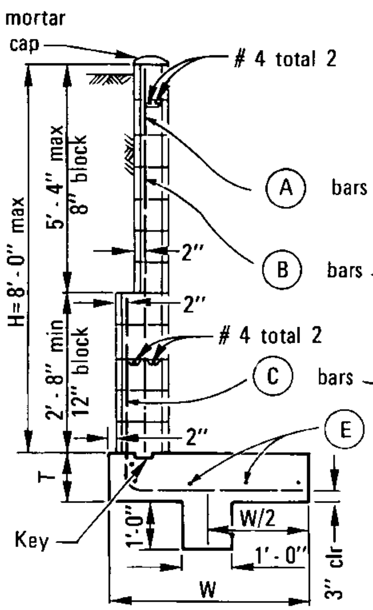
SPECIAL NOTE

Concrete consisting of portland cement, concrete aggregate, sand and water is designated in these Standard Drawings by a symbol consisting of a number, a letter and a number; for example, 564-C-3000. The first number is the weight of cement in pounds per cubic yard, the last number is the compressive strength at twenty-eight days and the letter indicates the grading of the aggregate. This designation is in the STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, published by the Building News, Incorporated.

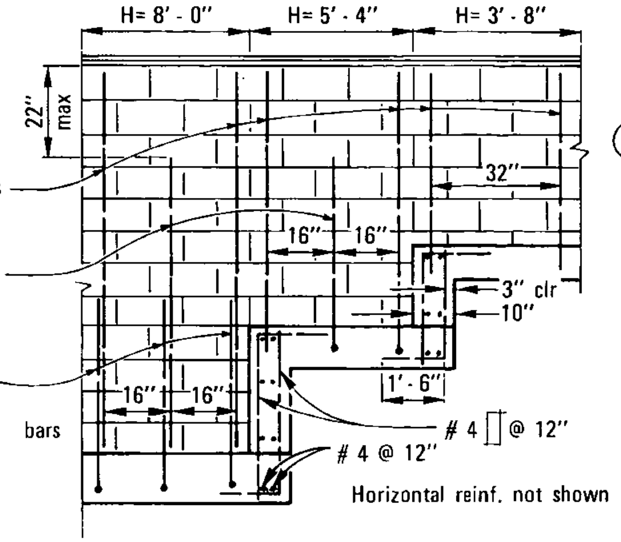
CONCRETE STRUCTURES



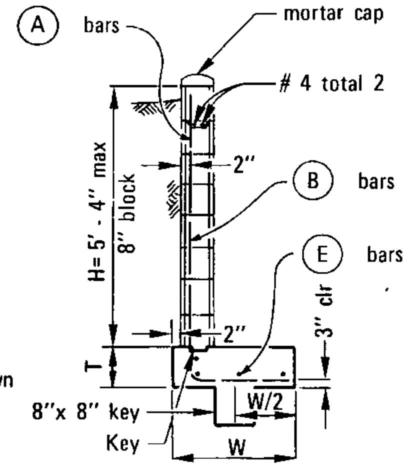
PLAN



TYPICAL SECTION
over 5' - 4"



ELEVATION



TYPICAL SECTION
5' - 4" max

DIMENSIONS AND REINFORCING STEEL			
H (max)	3' - 8"	5' - 4"	8' - 0"
T (min)	0' - 8"	0' - 10"	1' - 0"
W (min)	2' - 4"	3' - 6"	5' - 4"
(A) bars	# 4 @ 32"	# 4 @ 32"	# 4 @ 32"
(B) bars	——	# 4 @ 32"	# 4 @ 32"
(C) bars	——	——	# 6 @ 16"
(E) bars	# 4 total 4	# 4 total 5	# 4 total 6
max soil press. (psf)	500	600	800

NOTES

1. See Standard Drawings C-7 and C-8 for additional notes and details.
2. Fill all block cells with grout.

Revision	By	Approved	Date

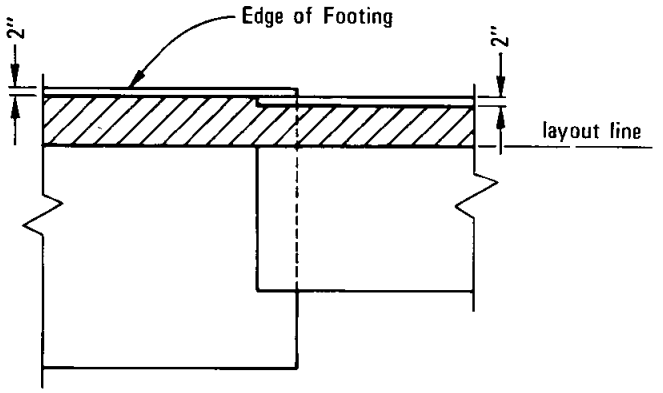
SAN DIEGO REGIONAL STANDARD DRAWING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

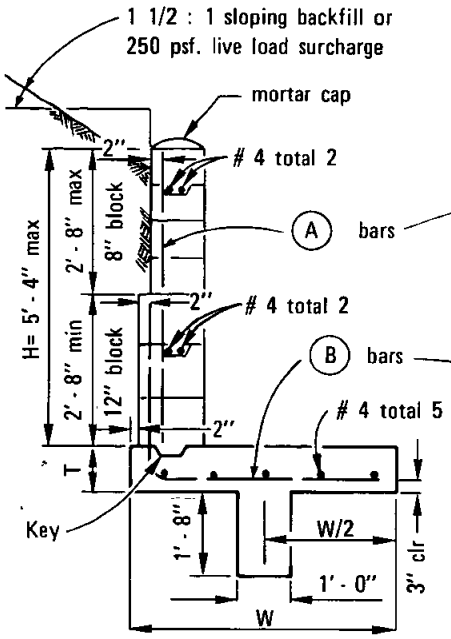
Allen A. Kercheval — Dec. 1975
Coordinator R.C.E. 19807 — Date

MASONRY RETAINING WALL TYPE 1
(LEVEL BACKFILL)

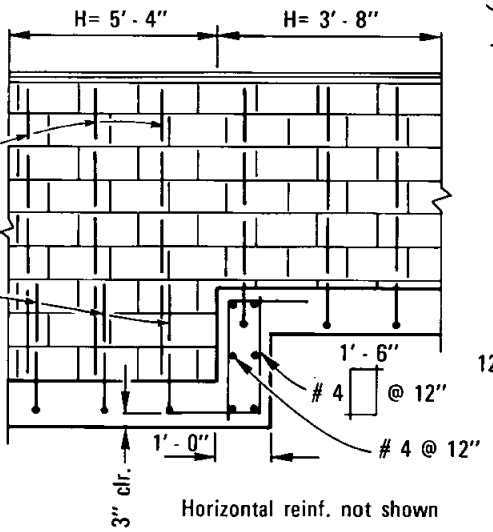
DRAWING NUMBER **C-1**



PLAN

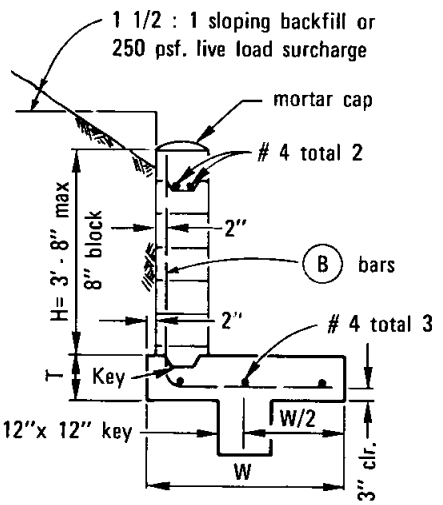


TYPICAL SECTION
over 3' - 8"



ELEVATION

Horizontal reinf. not shown



TYPICAL SECTION
3' - 8" max.

NOTES

1. See Standard Drawings C-7 and C-8 for additional notes and details.
2. Fill all block cells with grout.

DIMENSIONS AND REINFORCING STEEL		
H (max)	5' - 4"	3' - 8"
T (min)	0' - 10"	0' - 10"
W (min)	5' - 0"	3' - 9"
(A) bars	# 4 @ 16"	———
(B) bars	# 6 @ 16"	# 4 @ 16"
max. toe press. (psf)	700	550

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

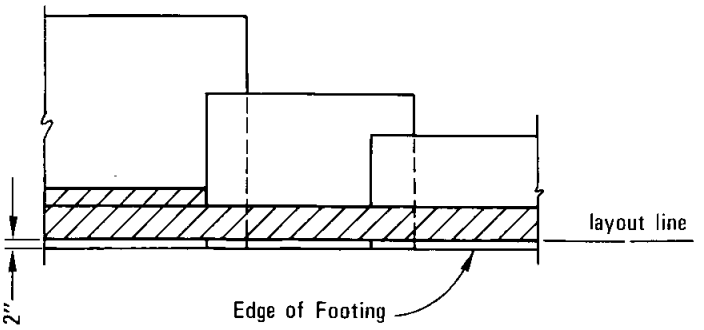
Allen A Kenkel Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER C-2

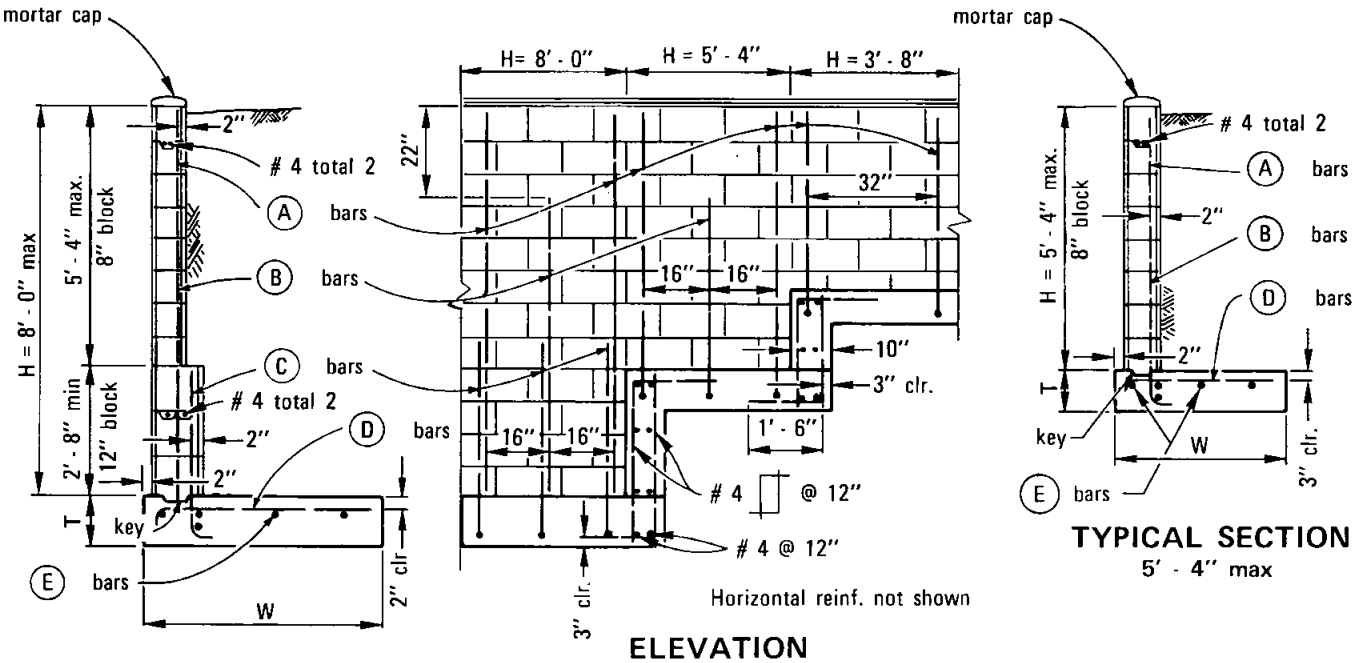
SAN DIEGO REGIONAL STANDARD DRAWING

MASONRY RETAINING WALL TYPE 2
(LIVE LOAD SURCHARGE OR SLOPING BACKFILL)

Revision	By	Approved	Date



PLAN



TYPICAL SECTION
over 5' - 4"

ELEVATION

TYPICAL SECTION
5' - 4" max

DIMENSIONS AND REINFORCING STEEL			
H (max)	3' - 8"	5' - 4"	8' - 0"
T (min)	0' - 8"	0' - 10"	1' - 0"
W (min)	2' - 4"	3' - 2"	4' - 9"
(A) bars	# 4 @ 32"	# 4 @ 32"	# 4 @ 32"
(B) bars	——	# 4 @ 32"	# 4 @ 32"
(C) bars	——	——	# 6 @ 16"
(D) bars	# 4 @ 32"	# 4 @ 16"	# 6 @ 16"
(E) bars	# 4 total 4	# 4 total 5	# 4 total 6
max. soil press. (psf)	1100	1600	2200

NOTES

1. See Standard Drawings C-7 and C-8 for additional notes and details.
2. Fill all blockcells with grout.

Revision	By	Approved	Date

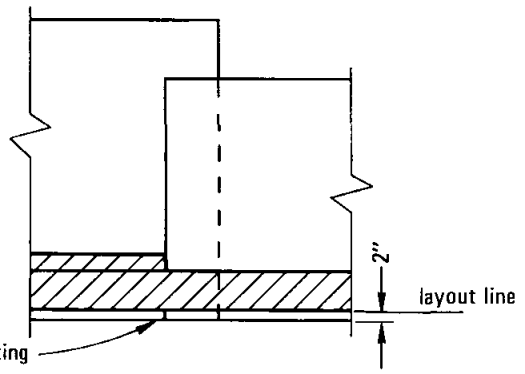
SAN DIEGO REGIONAL STANDARD DRAWING

MASONRY RETAINING WALL TYPE 3
(LEVEL BACKFILL)

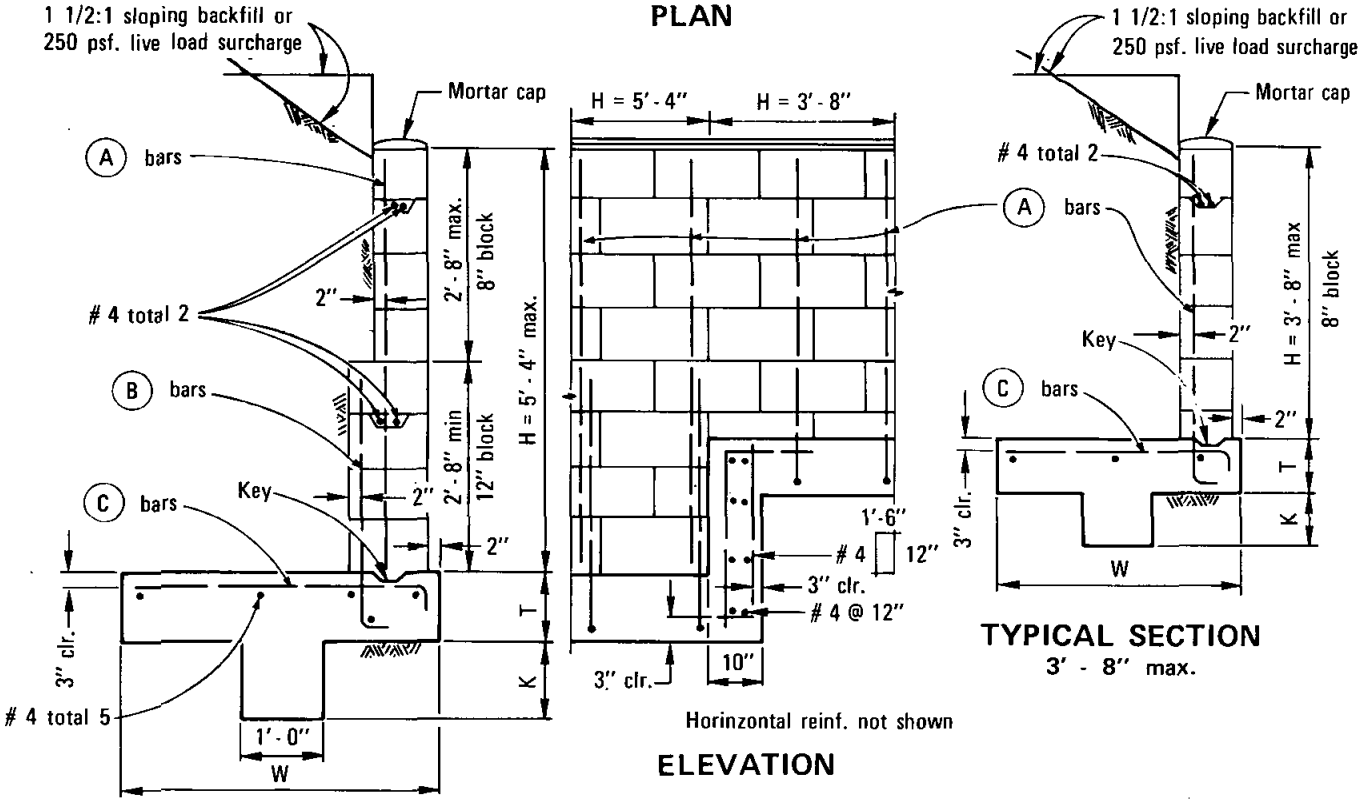
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER C-3



PLAN



TYPICAL SECTION
over 3' - 8"

ELEVATION

TYPICAL SECTION
3' - 8" max.

NOTES

1. See Standard Drawings C-7 and C-8 for additional notes and details.
2. Fill all block cells with grout.

DIMENSIONS AND REINFORCING STEEL				
H (max)	5' - 4"		3' - 8"	
T (min)	0' - 10"		0' - 8"	
W (min)	4' - 0"		3' - 0"	
(A) bars	# 4 @ 16"		# 4 @ 16"	
(B) bars	# 6 @ 16"		———	
Surcharge	sloping	live load	sloping	live load
(C) bars	# 6 @ 8"	# 6 @ 16"	# 6 @ 16"	# 6 @ 16"
K (min)	1' - 0"	0' - 8"	1' - 0"	0' - 8"
Toe press.	2700 psf.	1900 psf.	1700 psf	1430 psf

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

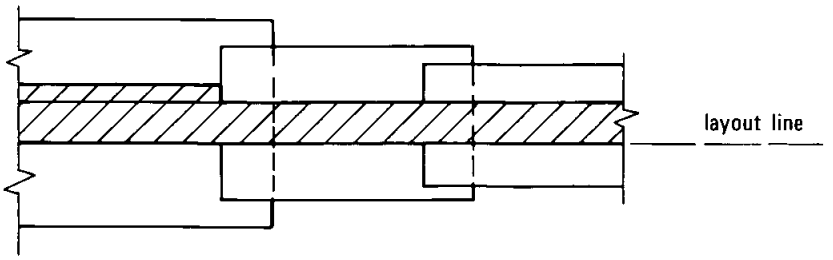
Allan A Kershaw Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER C-4

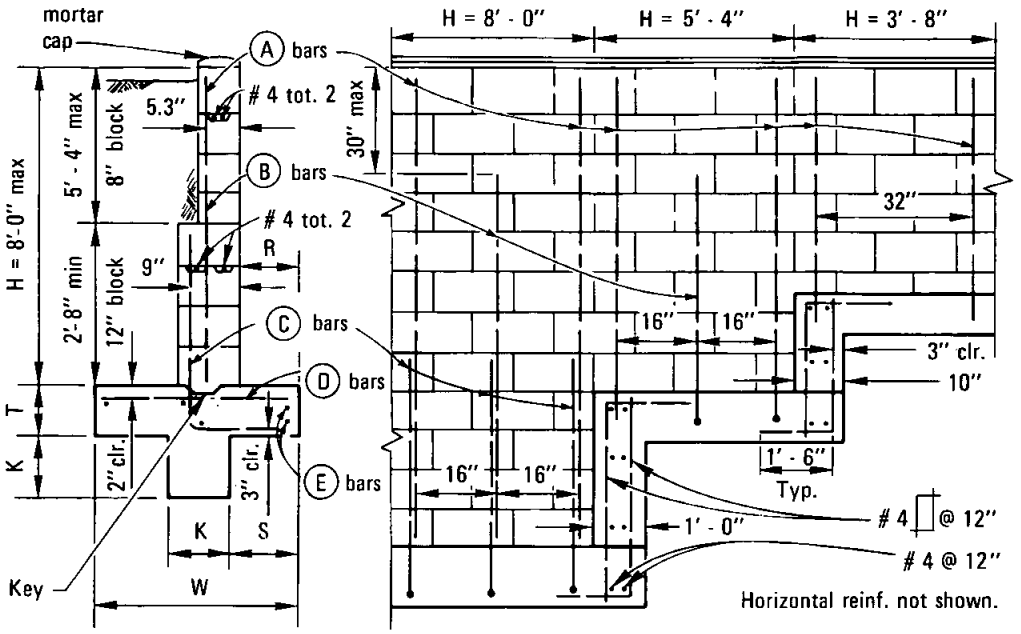
SAN DIEGO REGIONAL STANDARD DRAWING

MASONRY RETAINING WALL TYPE 4
(LIVE LOAD SURCHARGE OR SLOPING BACKFILL)

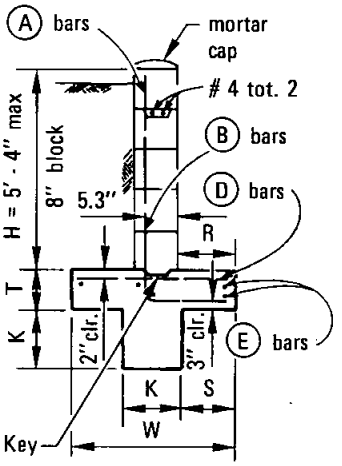
Revision	By	Approved	Date



PLAN



TYPICAL SECTION
over 5' - 4"



TYPICAL SECTION
5' - 4" max

ELEVATION

DIMENSIONS AND REINFORCING STEEL			
H (max)	3' - 8"	5' - 4"	8' - 0"
T (min)	0' - 8"	0' - 10"	1' - 0"
W (min)	2' - 1"	3' - 1"	4' - 3"
R	0' - 9"	1' - 2"	1' - 5"
S	0' - 8 1/2"	1' - 1/2"	1' - 7 1/2"
K	0' - 8"	0' - 8"	0' - 12"
(A) bars	# 4 @ 32"	# 4 @ 32"	# 4 @ 32"
(B) bars	———	# 4 @ 32"	# 4 @ 32"
(C) bars	———	———	# 7 @ 16"
(D) bars	# 4 @ 32"	# 4 @ 16"	# 4 @ 16"
(E) bars	# 4 total 5	# 4 total 5	# 4 total 6
max soil press. (psf)	774	1030	1660

NOTES
1. See Standard Drawing C-7 and C-8 for additional notes and details
2. Fill all block cells with grout.

Revision	By	Approved	Date

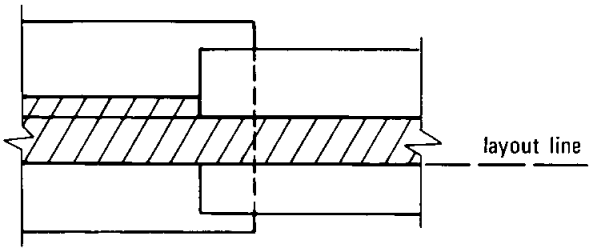
SAN DIEGO REGIONAL STANDARD DRAWING

MASONRY RETAINING WALL TYPE 5
(LEVEL BACKFILL)

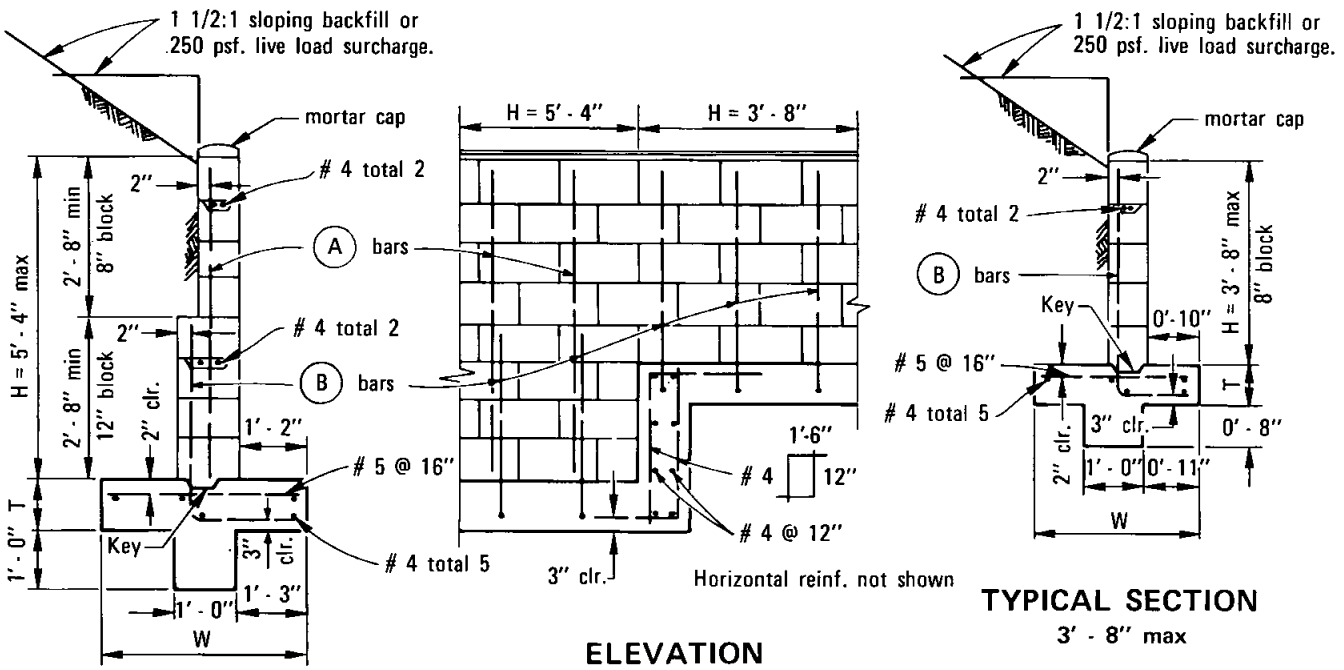
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER C-5



PLAN



TYPICAL SECTION
over 3' - 8"

ELEVATION

TYPICAL SECTION
3' - 8" max

NOTES

1. See Standard Drawings C-7 and C-8 for additional notes and details.
2. Fill all block cells with grout.

DIMENSIONS AND REINFORCING STEEL		
H (max)	5' - 4"	3' - 8"
T (min)	0' - 10"	0' - 8"
W (min)	3' - 10"	2' - 9"
(A) bars	# 4 @ 16"	——
(B) bars	# 6 @ 16"	# 4 @ 16"
Max. Toe Press. P.S.F.	2000	1400

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER C-6

SAN DIEGO REGIONAL STANDARD DRAWING

MASONRY RETAINING WALL TYPE 6
(LIVE LOAD SURCHARGE OR SLOPING BACKFILL)

Revision	By	Approved	Date

DESIGN CONDITIONS

Walls are to be used for the loading conditions shown for each type wall.
Design H shall not be exceeded.
Footing key is required except as shown otherwise or when found unnecessary by the Engineer.
Special footing design is required where foundation material is incapable of supporting toe pressure listed in table.

DESIGN DATA

Reinforced Concrete:
Fc = 1200 psi F'c = 3000 psi
Fs = 20,000 psi n = 10
Reinforced Masonry:
F'm = 600 psi Fm = 200 psi
Fs = 20,000 psi n = 50
Earth = 120 pcf and equivalent fluid Pressure = 36 psf per foot of height
Walls shown for 1 1/2:1 unlimited sloping surcharge are designed in accordance with Rankine's formula for unlimited sloping surcharge with $\phi = 33^{\circ}\ 42'$

REINFORCEMENT

Intermediate grade, hard grade, or rail steel deformation shall conform to ASTM A615 A616, A617.
Bars shall lap 40 diameters, where spliced, unless otherwise shown on the plans.
Bends shall conform to the Manuel of Standard practice, A.C.I.
Backing for hooks is four diameters.
All bar embedments are clear distances to outside of bar.
Spacing for parallel bars is center to center of bars.

CONCRETE

All concrete shall be 564 - C - 3000.

MASONRY

All reinforced masonry retaining walls shall be constructed of regular or light weight standard grade " A" units conforming to ASTM designation C-90 and manufactured in accordance with requirements of the Concrete Masonry Association Specifications. All masonry shall conform to the regulations of the Uniform Building Code.

MASONRY MORTAR

The mortar shall consist of one (1) part portland cement to three and one-half (3 1/2) parts graded mortar sand. Mortar shall be tempered with lime putty in an amount not exceeding one-quarter to one-half of the volume of the cement.
Mortar in horizontal joints shall fully cover all face shell and web members. Vertical joints shall be buttered to a depth greater than the thickness of the face shells of the block. Furrowing of mortar will not be permitted.

GROUT

The grout shall consist of one (1) part portland cement to three (3) parts clean sand for voids less than four inches. If desired, grout to be used in voids of 4" or greater dimensions, may be mixed of one (1) part portland cement to two (2) parts clean sand to two (2) parts pea gravel. Pea gravel shall be graded such that 100% passes 3/8" sieve and not more than 5% passes the No. 8 sieve. All cells shall be poured solid with grout.

EXCAVATION AND BACKFILL

Compaction of backfill material by jetting or ponding with water will not be permitted.
Each layer of backfill shall be moistened as directed by the Engineer and thoroughly tamped, rolled or otherwise compacted until the relative compaction is not less than 90%.
No backfill material shall be deposited against masonry retaining walls until the grout has developed a strength of 2,000 pounds per square inch in compression as determined by test 2" cubes, or until the masonry retaining wall has cured for a minimum of 14 days.

OPTIONAL MORTAR KEY

Embedment of the first course of block in a poured footing may be omitted by providing a mortar key. The key is formed by embedding a flat 2"x 4" flush with the top of the freshly poured footing. Remove the 2"x 4" after the concrete has started to harden.

Revision	By	Approved	Date

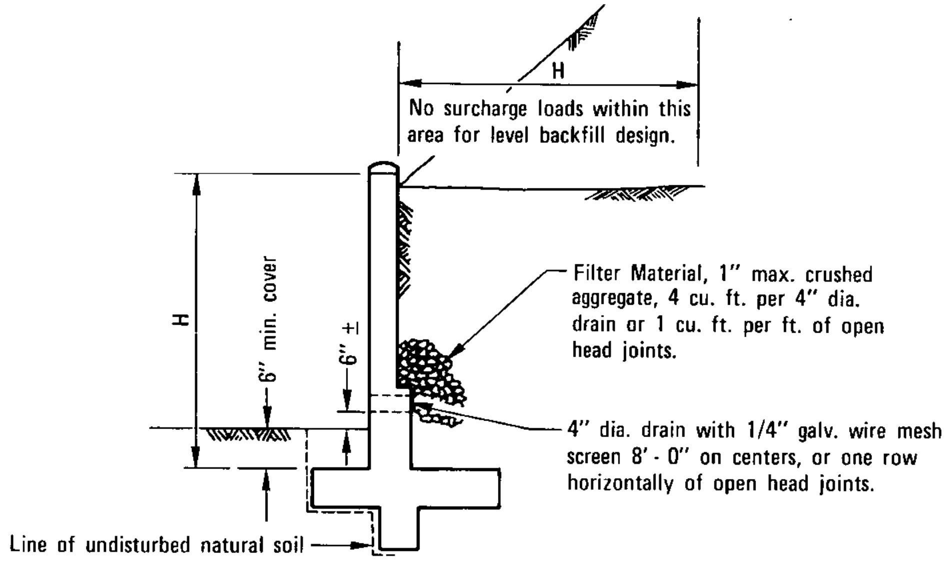
SAN DIEGO REGIONAL STANDARD DRAWING

GENERAL NOTES FOR MASONRY RETAINING WALLS

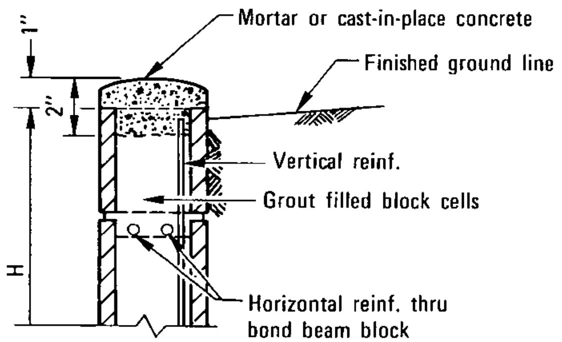
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel Dec. 1975
Coordinator R.C.E. 19807 Date

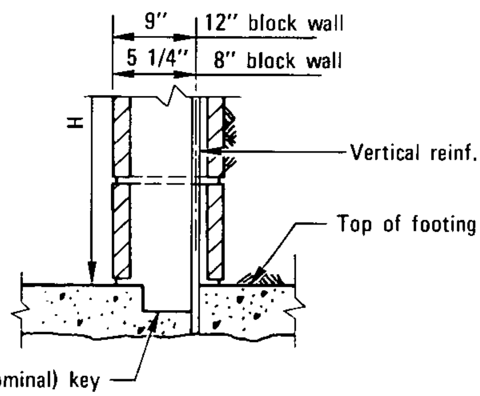
DRAWING NUMBER C-7



TYPICAL SECTION



CAP DETAIL



KEY DETAIL

NOTE

All masonry retaining walls shall be constructed with cap, key and drainage details as shown hereon.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

[signature] Dec. 1975

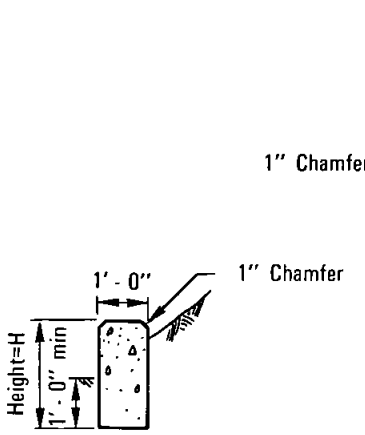
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **C-8**

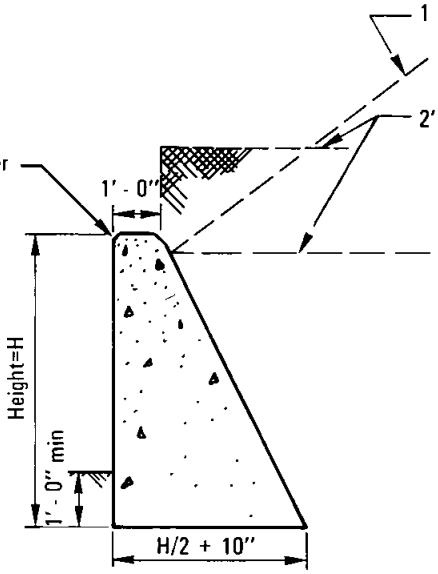
SAN DIEGO REGIONAL STANDARD DRAWING

DETAILS FOR MASONRY RETAINING WALL

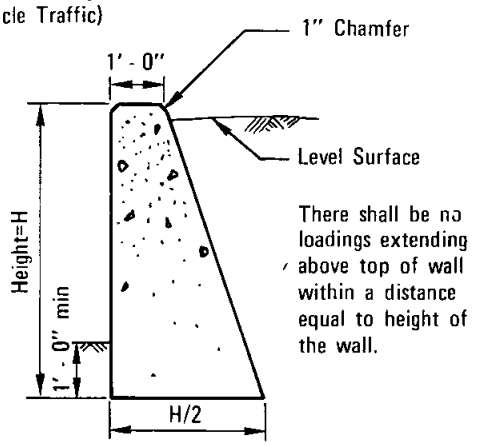
Revision	By	Approved	Date



TYPE–A WALL
(Applicable for all types of backfill loadings)

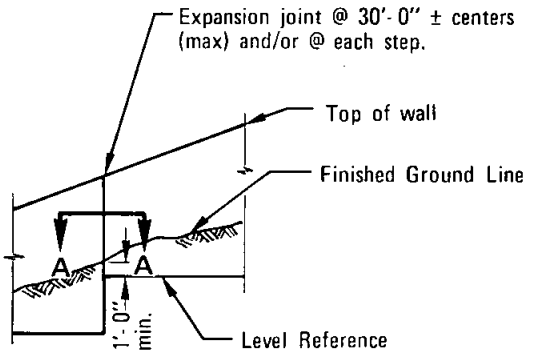


TYPE–B WALL



TYPE–C WALL

WALL TYPE	HEIGHT	BASE	CONC CF/FT
A	1' - 6"	1' - 0"	1.50
	2' - 0"	1' - 0"	2.00
B	3' - 0"	2' - 4"	4.99
	4' - 0"	2' - 10"	7.66
	5' - 0"	3' - 4"	10.82
	6' - 0"	3' - 10"	14.49
C	3' - 0"	1' - 6"	3.75
	4' - 0"	2' - 0"	6.00
	5' - 0"	2' - 6"	8.75
	6' - 0"	3' - 0"	12.00



TYPICAL ELEVATION

NOTE
See Standard Drawing C-10 for Section A–A, notes and details.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

GRAVITY RETAINING WALLS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER **C-9**

CONCRETE

Concrete shall be 564 - C - 3000.

DESIGN CONDITIONS

Walls are to be used for the loading conditions shown for each type wall. Design H may be exceeded by six inches before going to next size.

DESIGN DATA

Fc = 1200 psi F'c = 3000 psi
Earth = 120 pcf and equivalent fluid pressure = 36 psf per foot of height

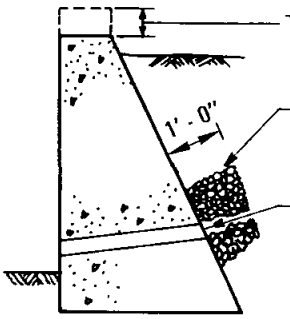
Walls shown for 1 1/2:1 unlimited sloping surcharge are designed in accordance with Rankine's Formula for unlimited sloping surcharge with $\phi = 33^{\circ}\ 42'$.
Note: Maximum toe pressure under wall footing = 1 1/2 tons. Special design required where footing material is incapable of supporting this pressure.

EXCAVATION AND BACKFILL

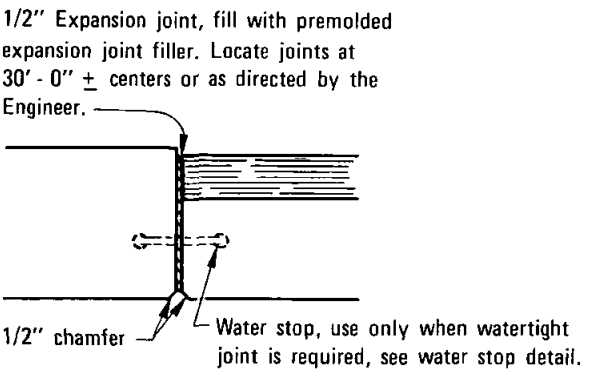
Compaction of backfill material by jetting or ponding with water will not be permitted.

Each layer of backfill shall be moistened as directed by the Engineer and thoroughly tamped, rolled or otherwise compacted until the relative compaction is not less than 90 percent.

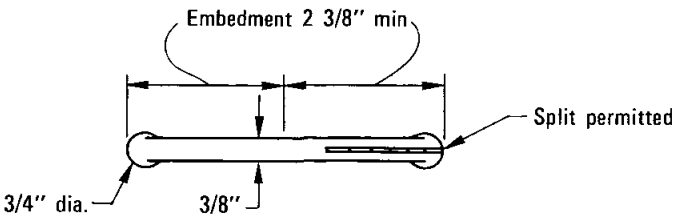
No backfill material shall be deposited against concrete retaining walls until the concrete has developed a strength of 2,500 pounds per square inch in compression as determined by test cyclinders, or until 28 days after wall has been placed.



TYPICAL DRAINAGE
WHEN H IS GREATER THAN 4' - 0"

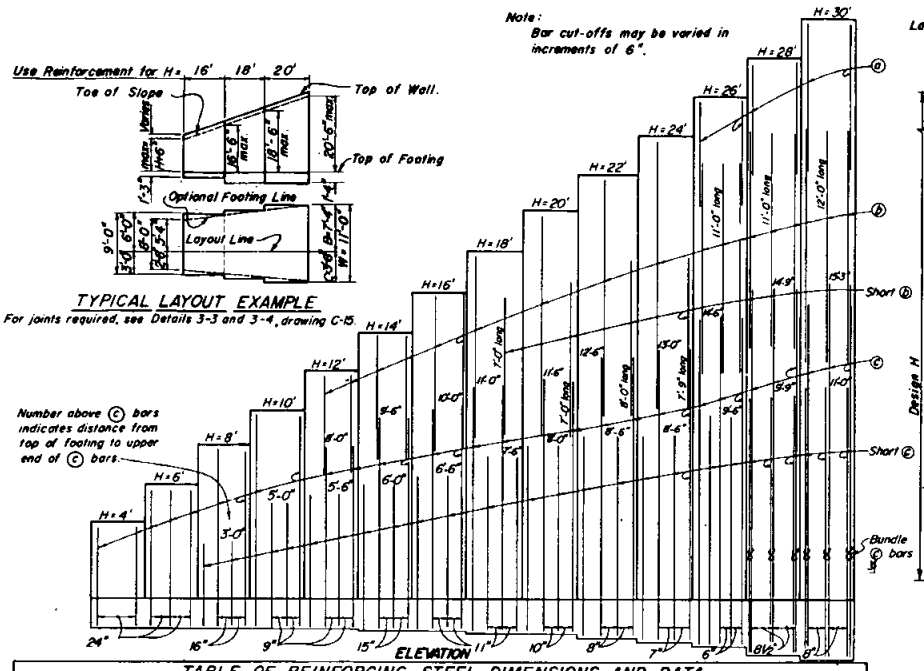


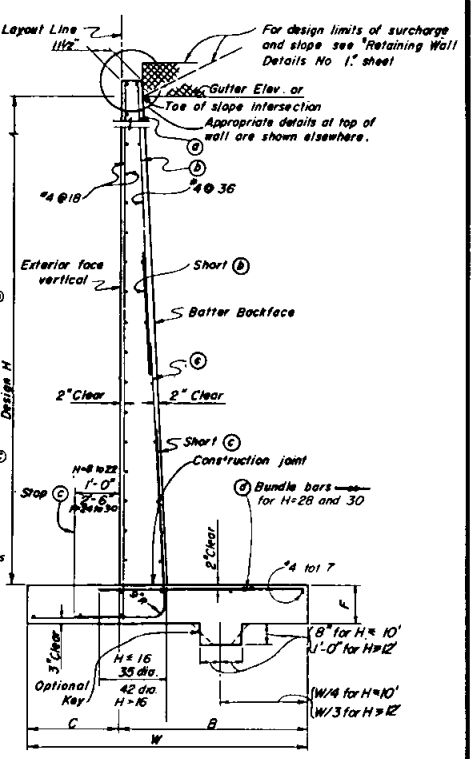
SECTION A–A



RUBBER WATERSTOP
Use only when watertight joint is required.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
Coordinator R.C.E. 19807 — Date: Dec. 1975	GENERAL NOTES AND DETAILS FOR GRAVITY RETAINING WALLS				
DRAWING NUMBER C-10					





Note:
For details not shown and drainage notes see "Retaining Wall Details No.1", drawing C-13.

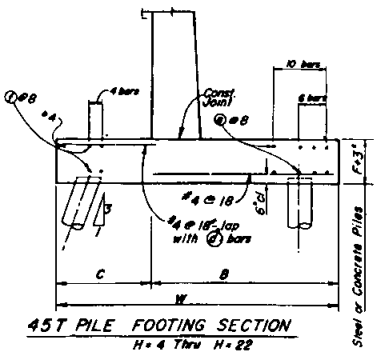
Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

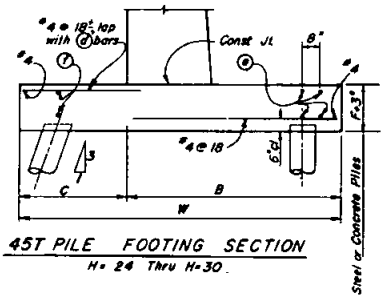
Design H		●4'	6'	8'	10'	12'	14'	16'	18'	20'	22'	24'	26'	28'	30'
W		3'-2"	4'-2"	5'-2"	6'-2"	7'-2"	8'-0"	9'-0"	10'-0"	11'-0"	12'-0"	13'-3"	14'-3"	15'-3"	16'-9"
C		1'-0"	1'-4"	1'-8"	2'-0"	2'-4"	2'-8"	3'-0"	3'-4"	3'-8"	4'-0"	4'-5"	4'-9"	5'-1"	5'-5"
B		2'-2"	2'-10"	3'-6"	4'-2"	4'-10"	5'-4"	6'-0"	6'-8"	7'-4"	8'-0"	8'-10"	9'-6"	10'-2"	11'-4"
F Spread Ftg.		1'-2"	1'-2"	1'-2"	1'-2"	1'-2"	1'-3"	1'-3"	1'-4"	1'-4"	1'-6"	1'-8"	1'-11"	2'-2"	2'-4"
Batter		1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	1/2:12	5/8:12	3/4:12	3/4:12	1"/8:12
ⓐ	bars													#6@24	#6@17
ⓑ	bars					#4@18	#6@30	#6@22	#7@22	#8@20	#8@16	#8@14	#8@12	#8@10	#8@8
©	bars	#5@24	#5@24	#5@16	#5@9	#6@9	#9@15	#9@11	#10@11	#10@10	#11@8	#11@7	#11@6	#10@5	#10@8
ⓓ	bars	#5@24	#5@24	#4@16	#4@9	#5@9	#8@15	#8@11	#10@11	#10@10	#10@8	#10@7	#10@6	#9@5	#9@8
Total ⓐ	bars	6-#6	6-#6	6-#6	10-#7	10-#7	10-#7	10-#7	6-#7	6-#7	6-#7	4-#7	4-#7	4-#7	4-#7
Total ⓑ	bars				4-#7	4-#7	4-#7	4-#7	4-#7	4-#7	4-#7	2-#7	2-#7	2-#7	2-#7
2' Level surcharge	Toe Pr k/sf	1.6	1.9	2.2	2.3	2.8	3.3	3.5	4.0	4.3	4.6	4.9	5.3	5.7	6.2
2:1 unlimited slope	Toe Pr k/sf	1.1	1.5	2.0	2.5	2.7	3.3	3.6	4.2	4.7	5.5	5.9	6.5	7.1	7.5
1½:1 limited slope	Toe Pr k/sf	1.3	1.7	2.1	2.5	2.9	3.4	3.8	4.3	4.8	5.4	5.8	6.5	7.2	7.5
Spread Footing	Steel lbs/ft	17	20	28	37	51	80	105	147	187	246	303	407	449	507
	Conc cf/ft	8.9	12.5	16.3	20.2	25.4	30.1	34.6	40.1	45.0	52.1	63.3	77.0	88.1	104.8
Pile Ftg	Steel lbs/ft	29	32	41	70	84	113	140	172	212	270	322	427	469	528
	Conc cf/ft	10.2	12.7	16.7	20.8	25.2	30.1	34.8	40.6	45.7	53.1	64.7	78.6	89.9	107.0

Note:
Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on plans.

● For pile footing Design H=4' use same footing dimensions as Design H=6'



45T PILE FOOTING SECTION
H=4 Thru H=22



45T PILE FOOTING SECTION
H=24 Thru H=30

Revision	By	Approved	Date

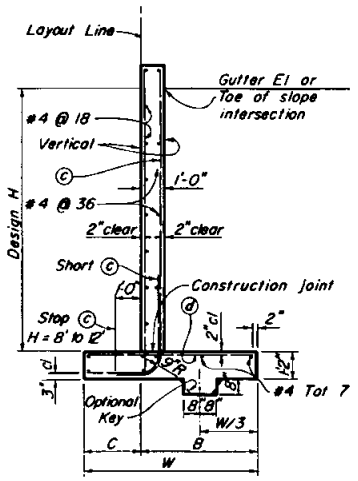
SAN DIEGO REGIONAL STANDARD DRAWING

REINFORCED CONCRETE RETAINING WALL TYPE 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

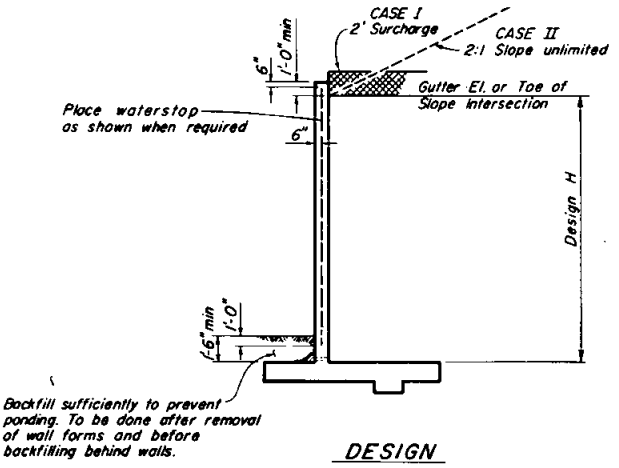
Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER C-11



SPREAD FOOTING SECTION

Place concrete in toe against undisturbed material, except as permitted by the Engineer.



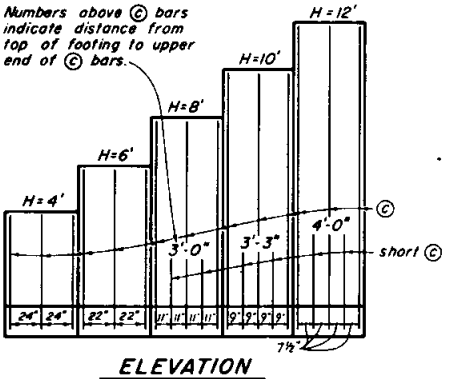
DESIGN

For drainage notes and other details, see "Retaining Wall Details No 1", drawing C-13.

Note:
Quantities apply to Design H portion and exclude the added portion above "Gutter Elevation."

TABLE OF REINFORCING STEEL DIMENSIONS AND DATA

Design H		◉ 4'	6'	8'	10'	12'
W		3'-2"	4'-2"	5'-2"	6'-2"	7'-2"
C		1'-0"	1'-4"	1'-8"	2'-0"	2'-4"
B		2'-2"	2'-10"	3'-6"	4'-2"	4'-10"
Ⓒ bars		#5 @ 24	#5 @ 22	#5 @ 11	#6 @ 9	#7 @ 7½
Ⓓ bars		#5 @ 24	#5 @ 22	#5 @ 22	#7 @ 18	#8 @ 15
Total Ⓔ bars		6 - #6	6 - #6	6 - #6	10 - #7	10 - #7
Total Ⓕ bars					4 - #7	4 - #7
CASE I - Toe Press. psf		1590	1930	2240	2550	2840
CASE II - Toe Press. psf		1060	1460	1860	2280	2700
Spread Footing	Steel lbs/ft	15	21	27	46	70
	Conc CF/ft	8.6	11.8	14.9	18.1	21.3
Pile Ftg	Steel lbs/ft	25	32	38	75	101
	Conc CF/ft	9.9	11.9	15.3	18.8	22.2



ELEVATION

Note:
Reinforcement detailed is to be placed in addition to that shown for spread footing. All piles not shown, see Pile Layout on plans.

◉ *For pile footing Design H=4' use same footing dimensions as Design H=6'*

NOTES

Design Conditions

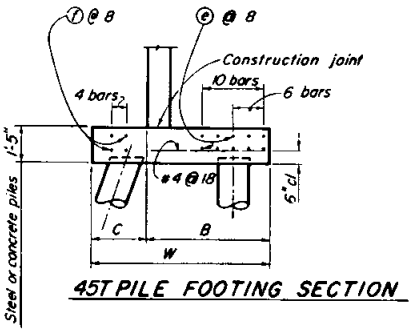
Design H may be exceeded by 6" before going to the next size. Footing key is required except when found unnecessary by the Engineer. Special footing design is required where foundation material is incapable of supporting toe pressure loads listed in table.

Design Data

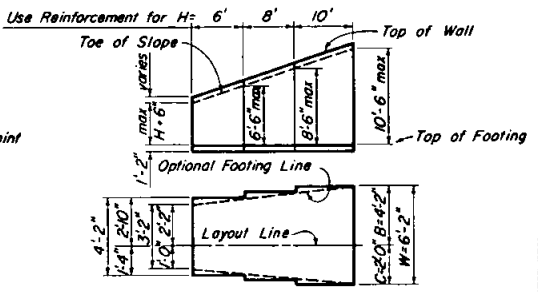
fc = 1300 psi f'c = 3250 psi fs = 24,000 psi
n = 10 earth = 120 pcf

Case I Equivalent fluid pressure = 36 psf max for determination of toe pressure. 27 psf min for determination of heel pressure.

Case II - Earth pressure determined from Rankine's formula with ϕ = 33°-42'.



45T PILE FOOTING SECTION



Note:
Bar cut-offs may be varied in increments of 6".

TYPICAL LAYOUT EXAMPLE

For joints required, see Details 3-3 and 3-4, drawing C-15

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

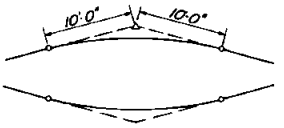
Allan A Kershaw — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER C-12

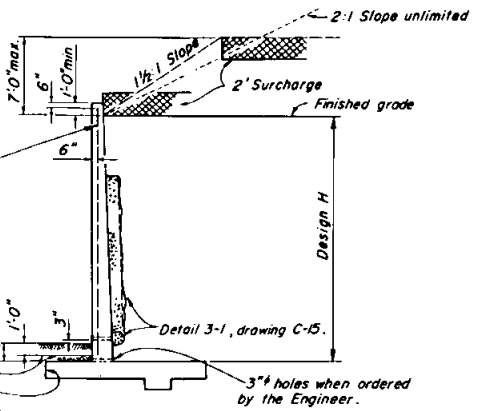
SAN DIEGO REGIONAL STANDARD DRAWING

REINFORCED CONCRETE RETAINING WALL TYPE 1A

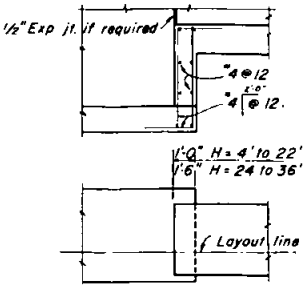
Revision	By	Approved	Date



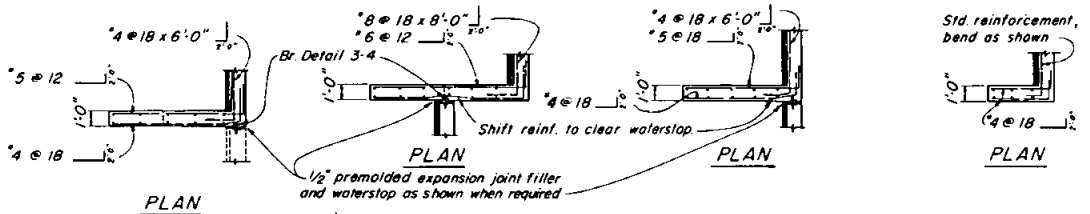
20' VC AT TOP OF WALL SLOPE CHANGE
WHERE SHOWN ON THE PLANS



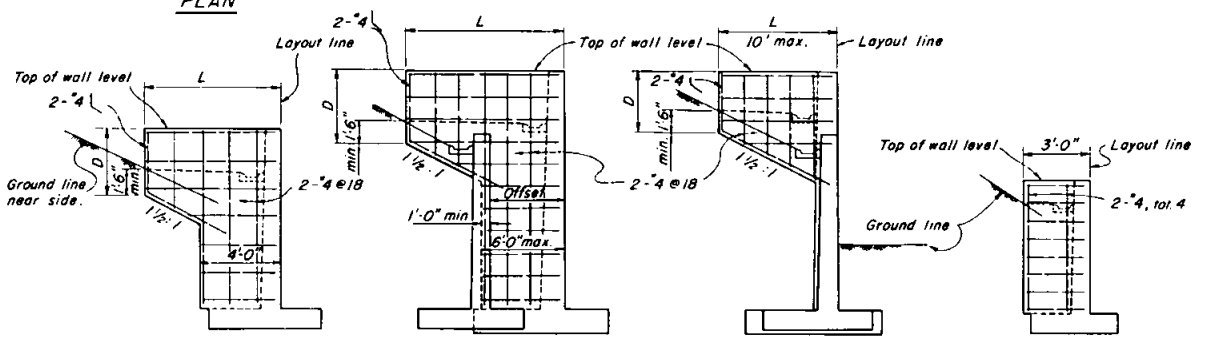
DESIGN AND DRAINAGE



FOOTING STEP



PLAN | PLAN | PLAN | PLAN



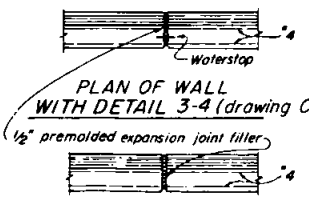
ELEVATION | ELEVATION | ELEVATION | ELEVATION

RETURN WALL TYPE 'A'
Use where H = 8' or less

RETURN WALL TYPE 'B'
Use where H = 10' or more on offset walls

RETURN WALL TYPE 'C'
Use where H = 10' or more on straight walls

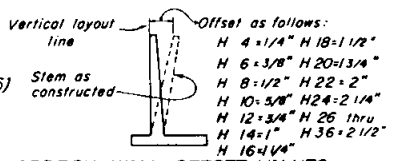
RETURN WALL TYPE 'D'
Use where H = 6' or less



PLAN OF WALL WITH DETAIL 3-4 (drawing C-15)

½" premolded expansion joint filler

PLAN OF WALL WITH EXPANSION JOINT ONLY



APPROX. WALL OFFSET VALUES

Values for offsetting forms to be determined by the Engineer.

NOTES:

Design Conditions:

Design H may be exceeded by 6" before going to the next size.
Footing key is required except when found unnecessary by the Engineer.
Special footing design is required where foundation material is incapable of supporting toe pressure loads listed in table.
Return wall not required unless shown elsewhere.

Design Data:

f_c = 1300 psi f_c' = 3250 psi f_s = 24,000 psi n = 10 earth = 120 pcf
2' Surcharge: Equivalent fluid pressure = 36 pcf max. for determination of toe pressure.
27 pcf min. for determination of heel pressure.

Earth pressures for 2:1 unlimited slope, 1½:1 slope, and 1½:1 unlimited slope, determined from Rankine's formula with ϕ = 33°-42'.

Revision	By	Approved	Date

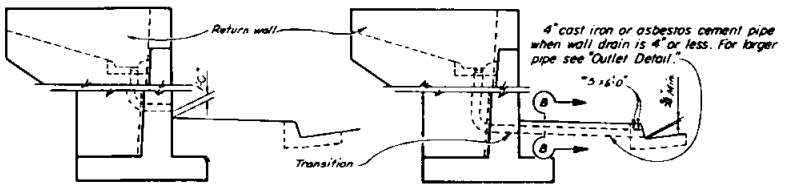
SAN DIEGO REGIONAL STANDARD DRAWING

RETAINING WALL DETAILS NO. 1

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

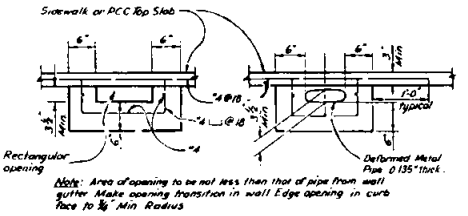
Allen A Kenchmark — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER C-13



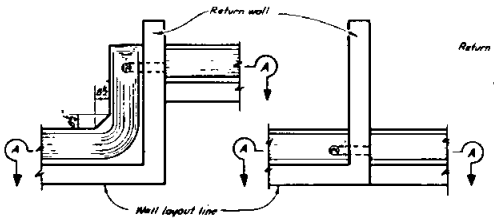
RETAINING WALL
FACE OF WALL OUTLET

RETAINING WALL
GUTTER OUTLET



Note: Area of opening to be not less than that of pipe from wall gutter. Make opening transition in wall. Edge opening in curb face to ¾" Min. Radius.

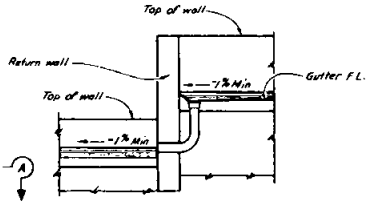
OUTLET DETAIL–SECTION B-B



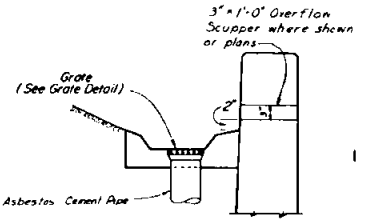
PLAN
OFFSET WALL

PLAN
CONTINUOUS WALL

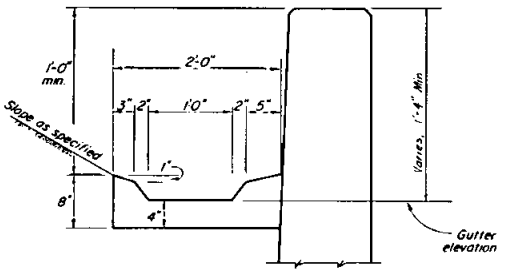
DRAIN THROUGH RETURN WALL



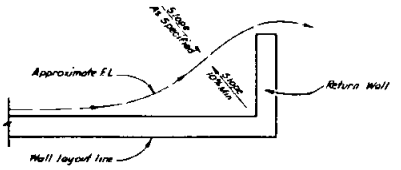
SECTION A–A



WALL DRAIN DETAIL

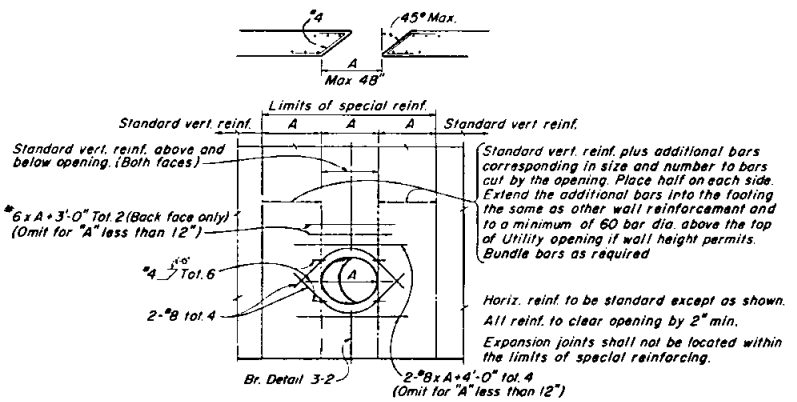


TYPICAL GUTTER DETAIL



WALL DRAINAGE
WHERE GUTTER NOT REQUIRED

GRATE DETAIL
Sizes to fit Standard Hubs



RETAINING WALL–UTILITY OPENING
To be used in conjunction with the " Retaining Wall Type 1" sheet.
Max. size of Opening (A)=48"

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

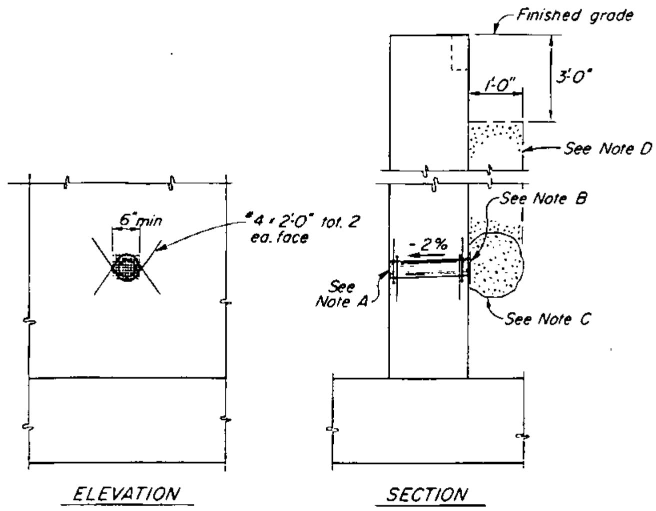
Allan A Kaufman — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER C-14

SAN DIEGO REGIONAL STANDARD DRAWING

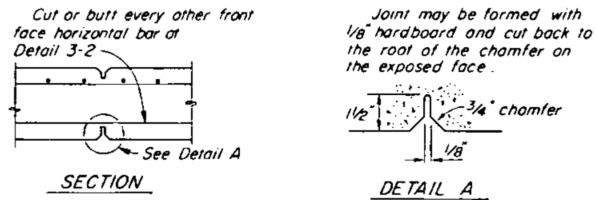
RETAINING WALL DETAILS NO. 2

Revision	By	Approved	Date



WEEP HOLE AND PERVIOUS BACKFILL

DETAIL 3-1



WEAKENED PLANES

DETAIL 3-2

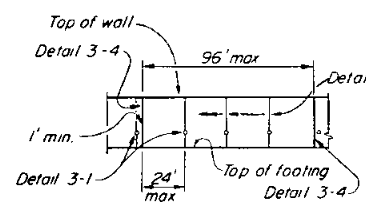
Notes :

A. 4"ϕ drains @ 25' max. center to center (9' c-c for Type 3 and 9'-3" c c for Type 4 Retaining Walls) For walls adjacent to sidewalks or curbs, provide 4" cast iron or asbestos cement pipe under the sidewalk to discharge thru curb face. Exposed wall drains shall be located 3"± above finished grade.

B. 6" square aluminum or galvanized steel wire 4 mesh hardware cloth. (Min wire diameter 0.03") Anchor firmly to backface.

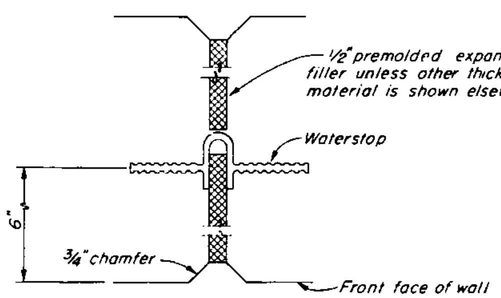
C. One cubic foot pervious backfill material in a burlap sack, securely tied.

D. Pervious backfill material continuous behind retaining wall.



WALL EXPANSION JOINTS AND WEAKENED PLANES

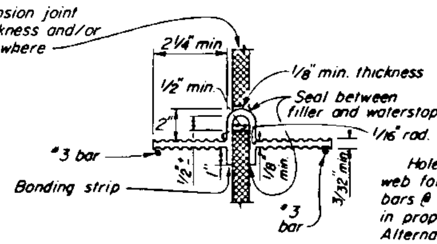
DETAIL 3-3



WALL EXPANSION JOINT

DETAIL 3-4

Waterstop to have 5 or more pairs of raised ribs to provide 0.1 sq. in. min. rib cross-section area on each half of the waterstop. Height of ribs to be 3/32" min.



Holes will be permitted in the outer 1/2" of the web for wire, rings, etc.. Tie web to #3 reinforcing bars @ 12" max. intervals to support the waterstop in proper position during concrete placement. Alternative detail may be submitted for approval of the Engineer.

WATERSTOP

DETAIL 3-6

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

RETAINING WALL DETAILS NO. 3

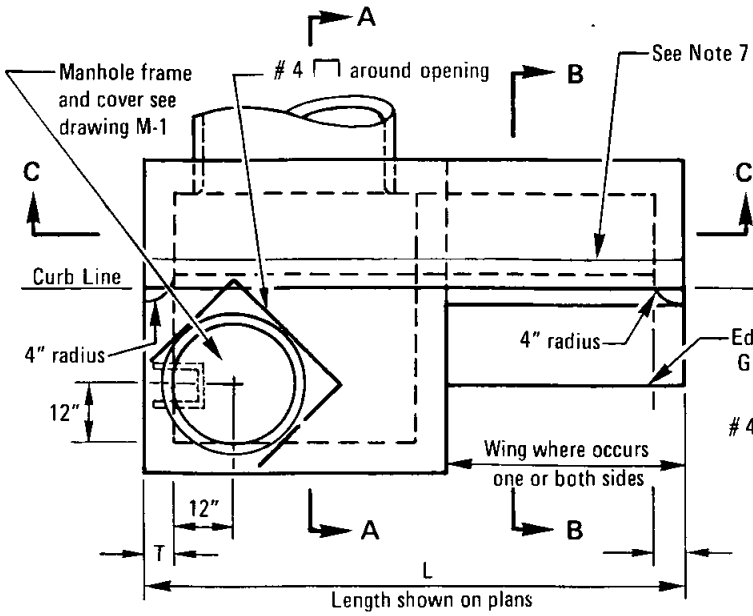
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

[signature] Dec. 1975

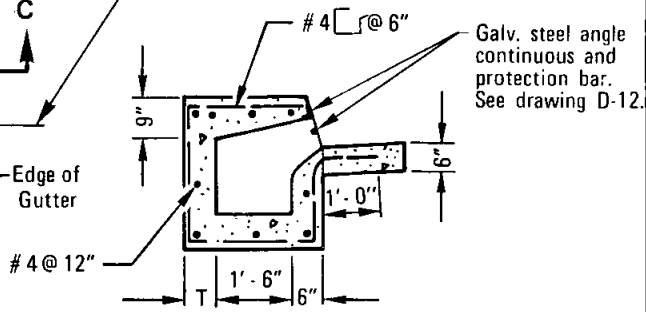
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **C-15**

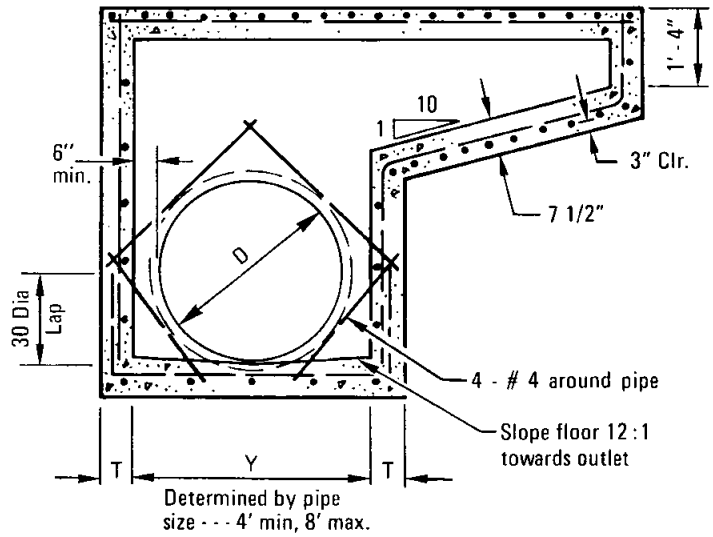
DRAINAGE SYSTEMS



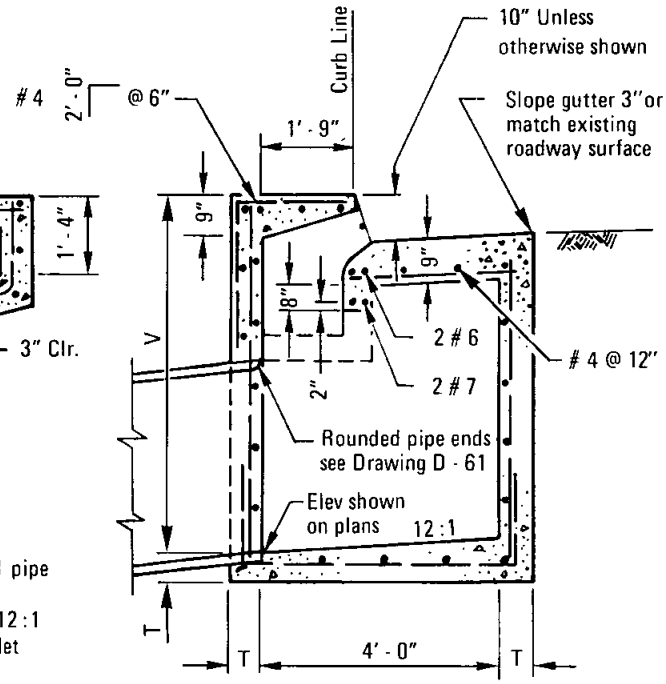
PLAN



SECTION B–B



SECTION C–C



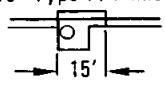
SECTION A–A

NOTES:

1. See Standard Drawings D-11 & D-12 for additional notes and details.
2. Types are designated as follows: (no wing) A, (one wing) A-1, (two wings) A-2.
3. Exposed edges of concrete shall be rounded with a radius of 1/2".
4. When V exceeds 4' steps shall be installed. See Standard Drawing D-11 for details.
5. Concrete gutter to match adjacent gutters.
6. An expansion joint shall be placed at the ends of the inlet where the curb is to adjoin.
7. Provide 1/4" tooled groove in top slab in line with back of adjacent curb.
8. Surface of top slab shall be sidewalk finished to drain toward street at a slope of 1/4" per foot.
9. Maintain 1 1/2" clear spacing between reinforcing and surface unless otherwise noted.

LEGEND ON PLANS

15' Type A-1 inlet



Revision	By	Approved	Date

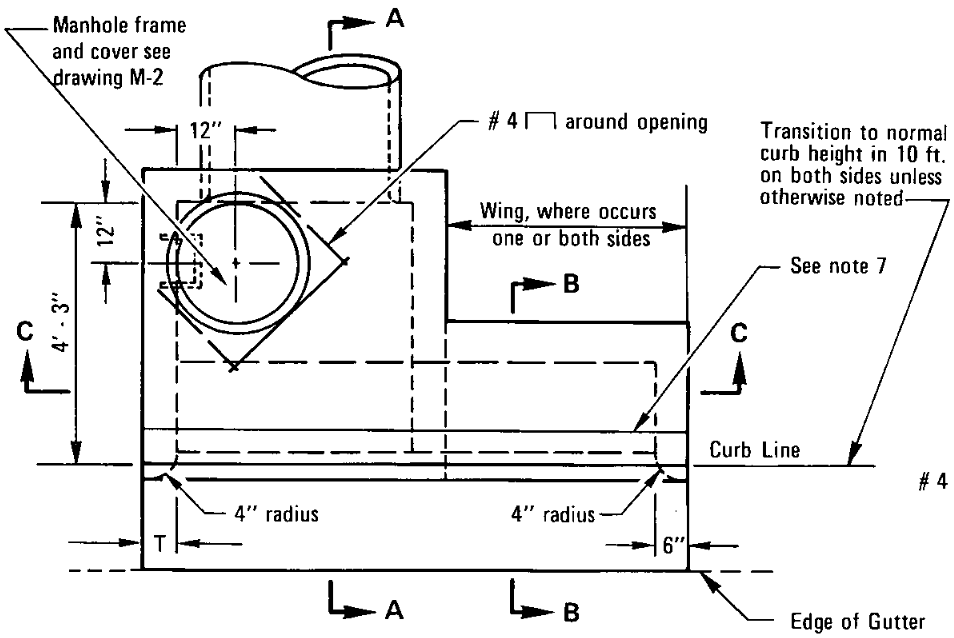
SAN DIEGO REGIONAL STANDARD DRAWING

CURB INLET - TYPE A

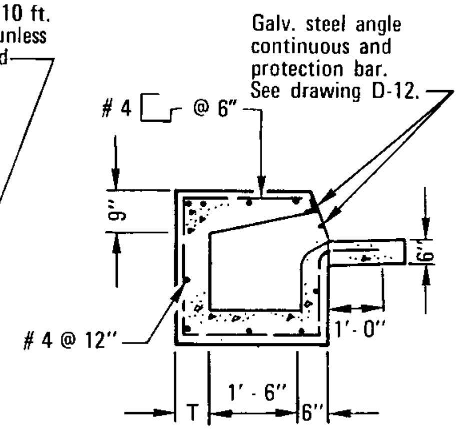
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kucheman — Coordinator R.C.E. 19807 — Dec. 1975 Date

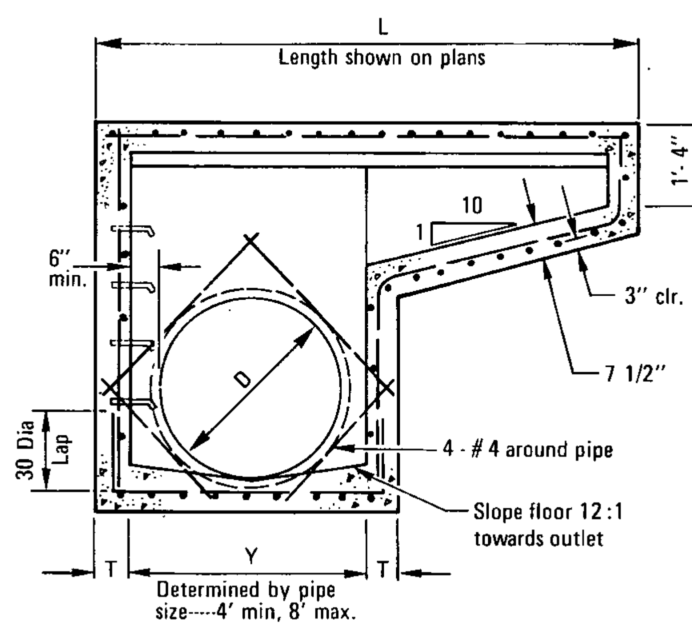
DRAWING NUMBER **D-1**



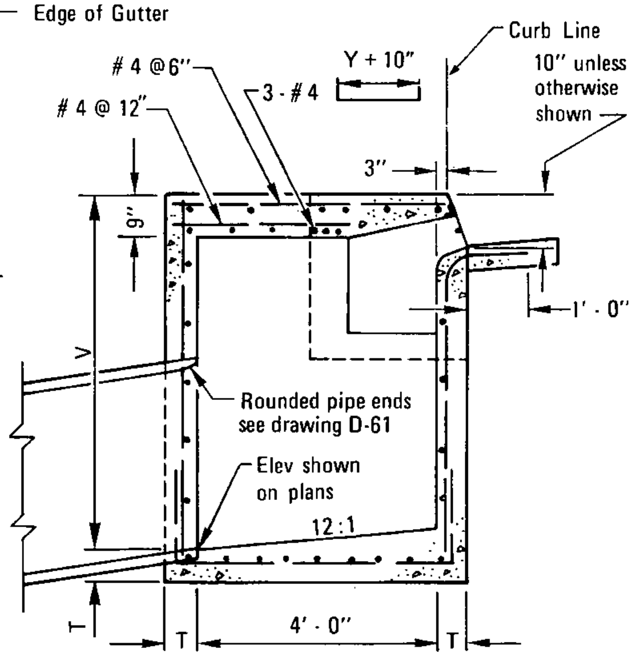
PLAN



SECTION B—B



SECTION C—C



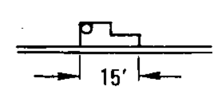
SECTION A—A

NOTES:

1. See Standard Drawings D-11 & D-12 or additional notes and details.
2. Types are designates as follows: (no wing) B, (one wing) B-1, (two wings) B-2.
3. Exposed edges of concrete shall be rounded with a radius of 1/2".
4. When V exceeds 4' steps shall be installed. See Standard Drawing D-11 for details.
5. Concrete gutter to match adjacent gutters.
6. An expansion joint shall be placed at the ends of the inlet where the curb is to adjoin.
7. Provide 1/4" tooled groove in top slab in line with back of adjacent curb.
8. Surface of top slab shall be sidewalk finished to drain toward street at a slope of 1/4" per foot.
9. Maintain 1 1/2" clear spacing between reinforcing and surface unless otherwise noted.

LEGEND ON PLANS

15' Type B-1 inlet



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A. Kercheval Dec. 1975

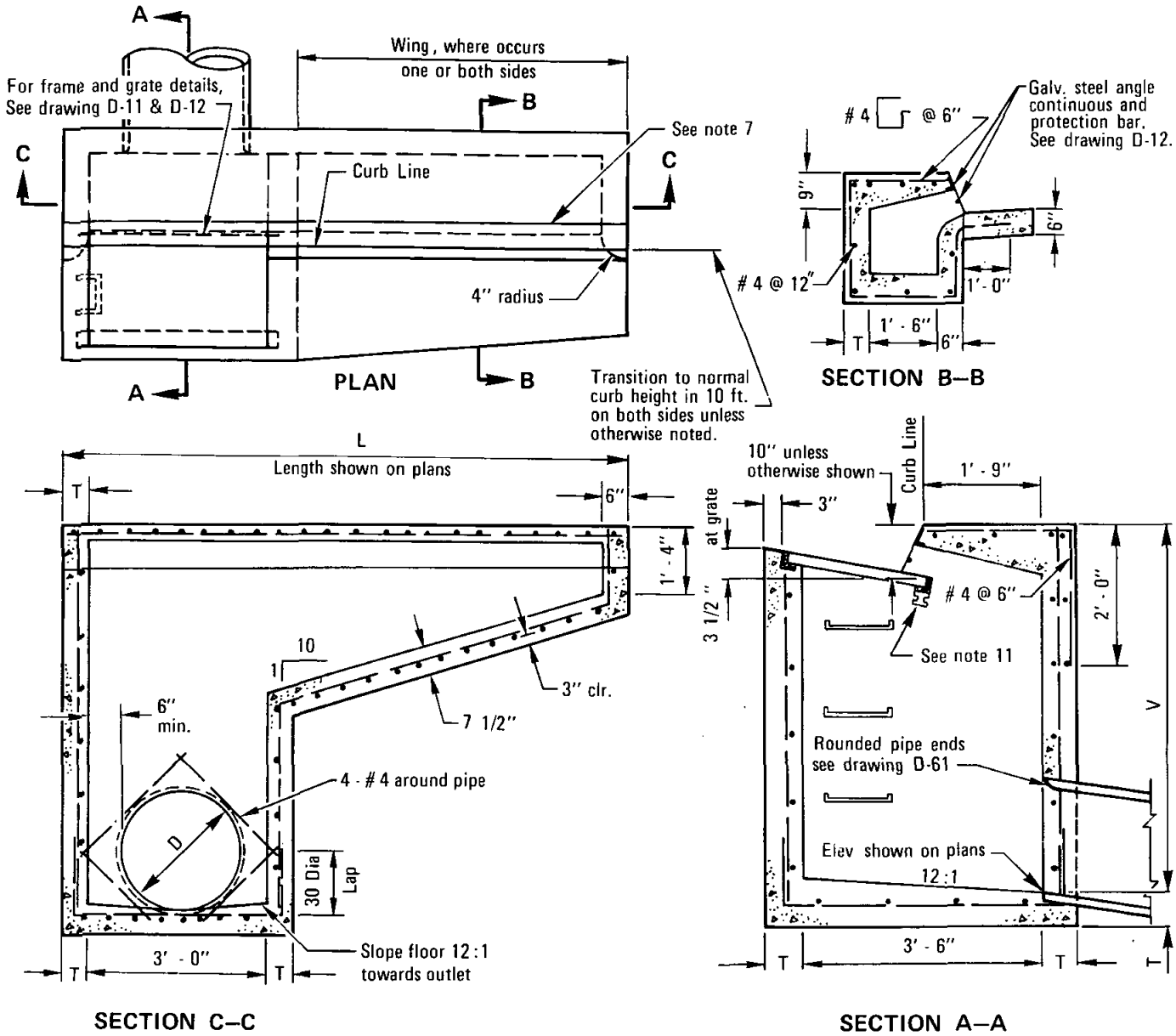
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

CURB INLET - TYPE B

Revision	By	Approved	Date

DRAWING NUMBER **D-2**

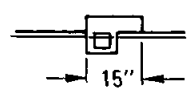


NOTES:

1. See Standard Drawings D-11 & D-12 for additional notes and details.
2. Types are designated as follows: (no wing) C, (one wing) C-1, (two wings) C-2.
3. Exposed edges of concrete shall be rounded with a radius of 1/2".
4. When V exceeds 4 ft. steps shall be installed. See Standard Drawing D-11 for details.
5. Concrete gutter to match adjacent gutters.
6. An expansion joint shall be placed at the ends of the inlet where the curb is to adjoin.
7. Provide 1/4" tooled groove in top slab in line with back of adjacent curb.
8. Surface of top slab shall be sidewalk finished to drain toward street at a slope of 1/4" per foot.
9. Maintain 1 1/2" clear spacing between reinforcing and surface unless otherwise noted.
10. Where inlet is to be constructed on grade and Standard Drawing D-20 concrete apron is required, lift down-grade end of grate as shown on D-20.
11. When G-1 & G-2 grates are used place 3"-5.7 lb. steel I-beam, 3.5' long.

LEGEND ON PLANS

15" Type C-1 Inlet



Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

CURB INLET - TYPE C

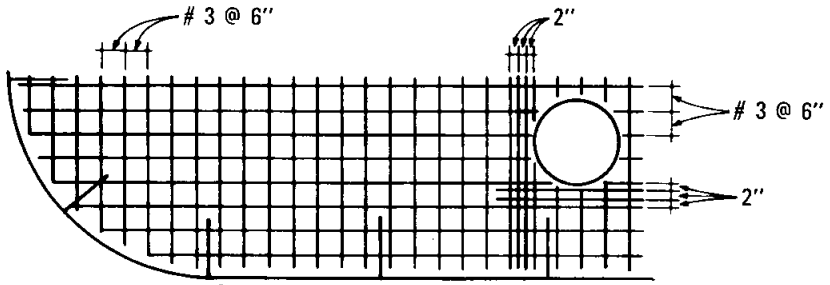
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kershaw — Coordinator R.C.E. 19807 — Dec. 1975 Date

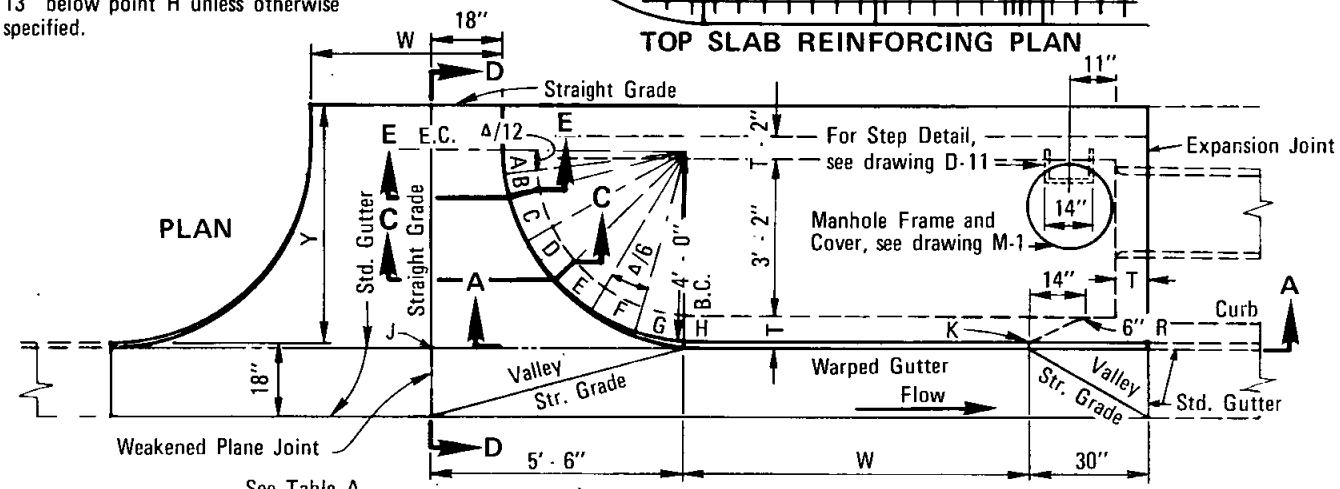
DRAWING NUMBER **D-3**

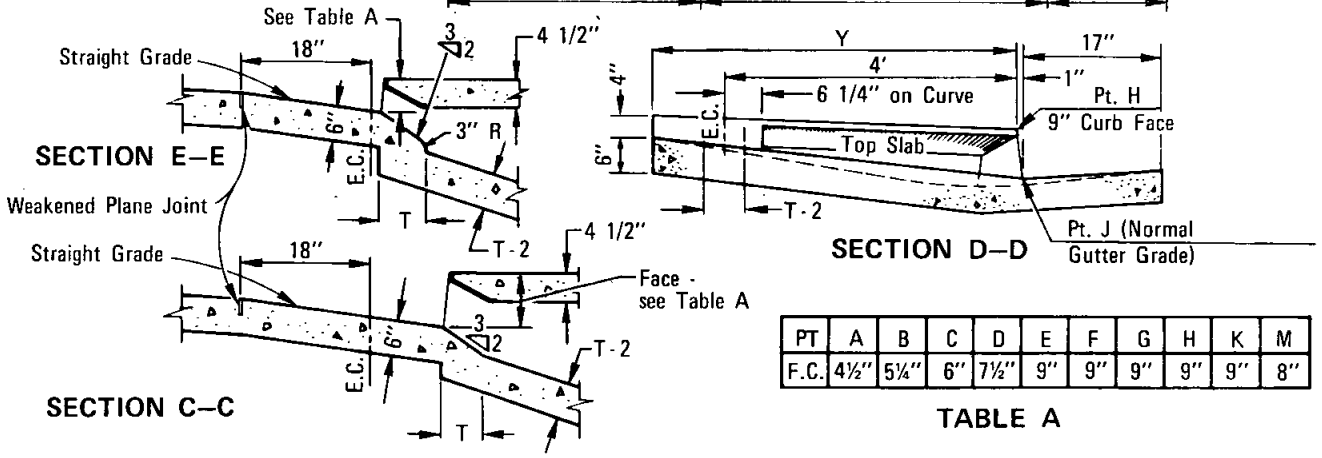
DIMENSIONS

T = 8" if V is less than 8'.
T = 10" if V is 8' or more.
V = 5' unless otherwise specified.
V = D + 32" minimum.
W = 7' unless otherwise specified.
Y = 5' unless otherwise specified.
Width of driveway, W, shall be 10' unless otherwise specified.
Elevation of point N shall be 13" below point H unless otherwise specified.



TOP SLAB REINFORCING PLAN



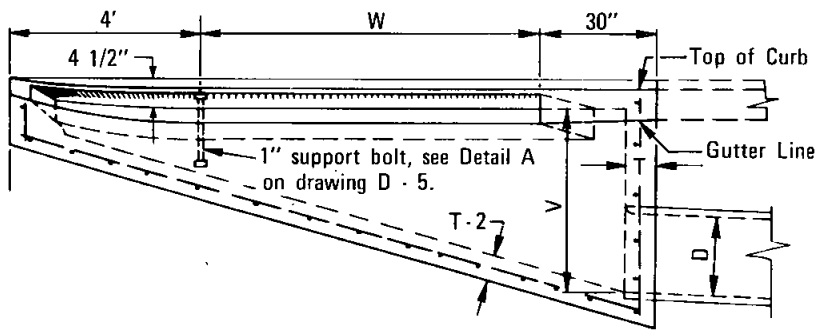


PT	A	B	C	D	E	F	G	H	K	M
F.C.	4½"	5¼"	6"	7½"	9"	9"	9"	9"	9"	8"

TABLE A

NOTES

1. Steel Plate should be of one continuous piece with curve portion a circular arc. Length = Width + 18" + circular arc.
2. # 4 rebar 30" long, 1' O.C. shall be installed in top of walls for ties to top and gutters.
3. The reinforcing steel in the top slab shall be # 3 bars 6" O.C. unless otherwise specified. Clearance shall be 1 1/2" from the bottom of the slab.
4. Concrete for the inlet top to be placed at the same time as the s/w curb and gutter.
5. Concrete shall be 564 - C - 3000.
6. Exposed edges of concrete shall be rounded with a radius of 1/2".
7. Surface of top slab shall be sidewalk finished to drain toward street at a slope of 1/4" per foot.



SECTION A–A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

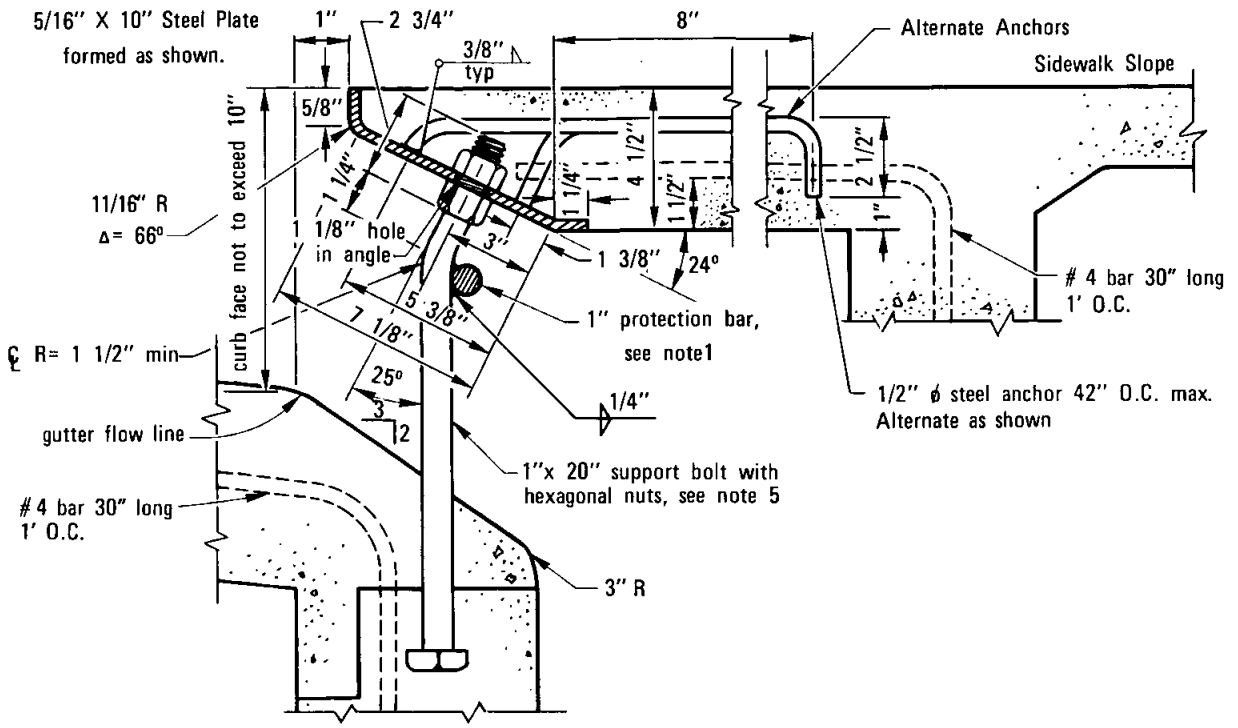
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

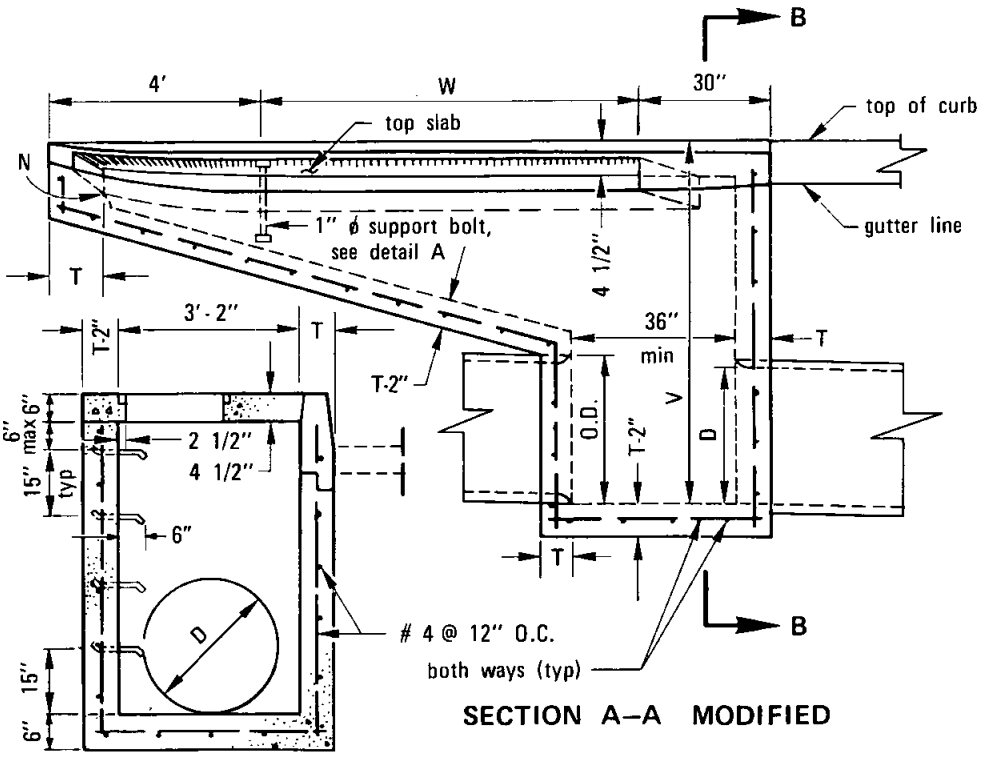
CURB INLET - TYPE D

DRAWING NUMBER D-4

Revision	By	Approved	Date



DETAIL—A



SECTION A—A MODIFIED

SECTION B—B

NOTES

1. A plain, round steel protection bar 1" in dia. shall be installed. Bar shall be embedded 5" at each end.
2. Leave 8" hole blocked out in bottom placing of concrete for bolts placed at same time as gutter.
3. All exposed metal parts shall be galvanized.
4. All galvanizing damaged by welding shall receive two coats of aluminum paint.
5. Support bolts shall be spaced at not more than 5' - 0" O.C.
6. Adjusting nuts to be tightened and secured in place when steel plate is in proper position.

Revision	By	Approved	Date

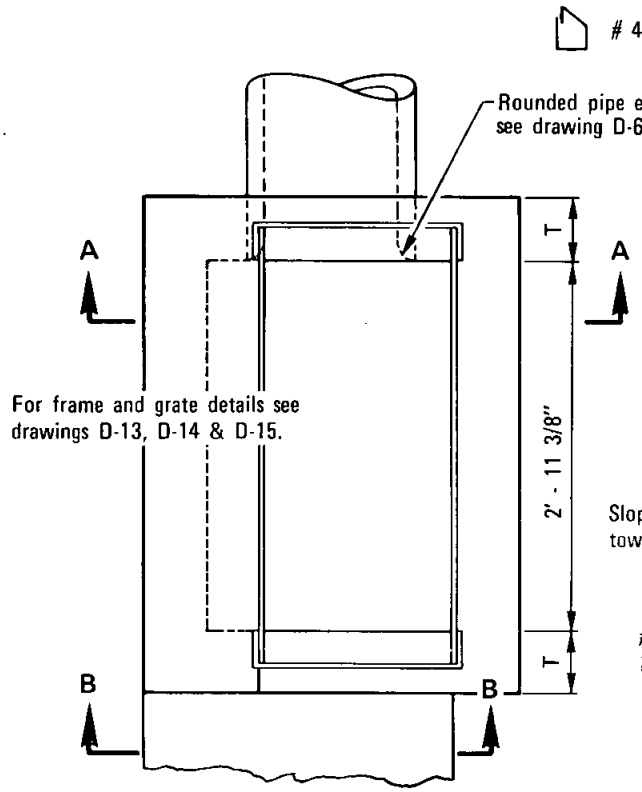
SAN DIEGO REGIONAL STANDARD DRAWING

CURB INLET - TYPE D (DETAILS)

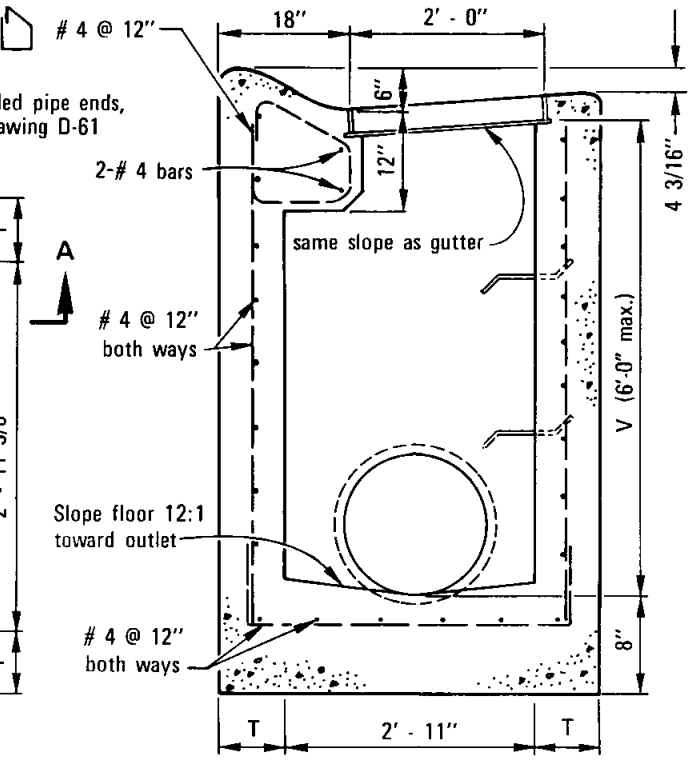
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

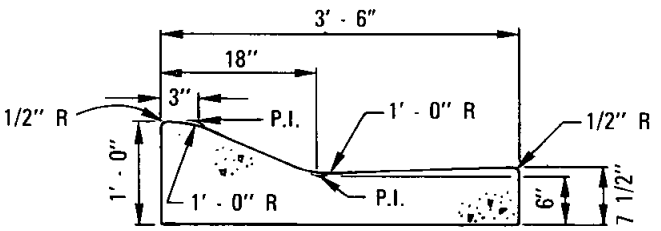
DRAWING NUMBER **D-5**



PLAN



SECTION A–A



SECTION B–B

NOTES

1. See Standard Drawing D-11 for dimension T and additional notes and details.
2. When V exceeds 4', steps shall be installed. See Standard Drawing D - 11 for details.
3. Exposed edges of concrete shall be rounded with a radius of 1/2".
4. Maintain 1 1/2" clear spacing between reinforcing and surface.
5. Type E inlet to be used only with rolled curb. See Standard Drawing G - 4.
6. Transition 10' to curb Section B-B at inlet, both sides.

LEGEND ON PLANS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenkel — Dec. 1975

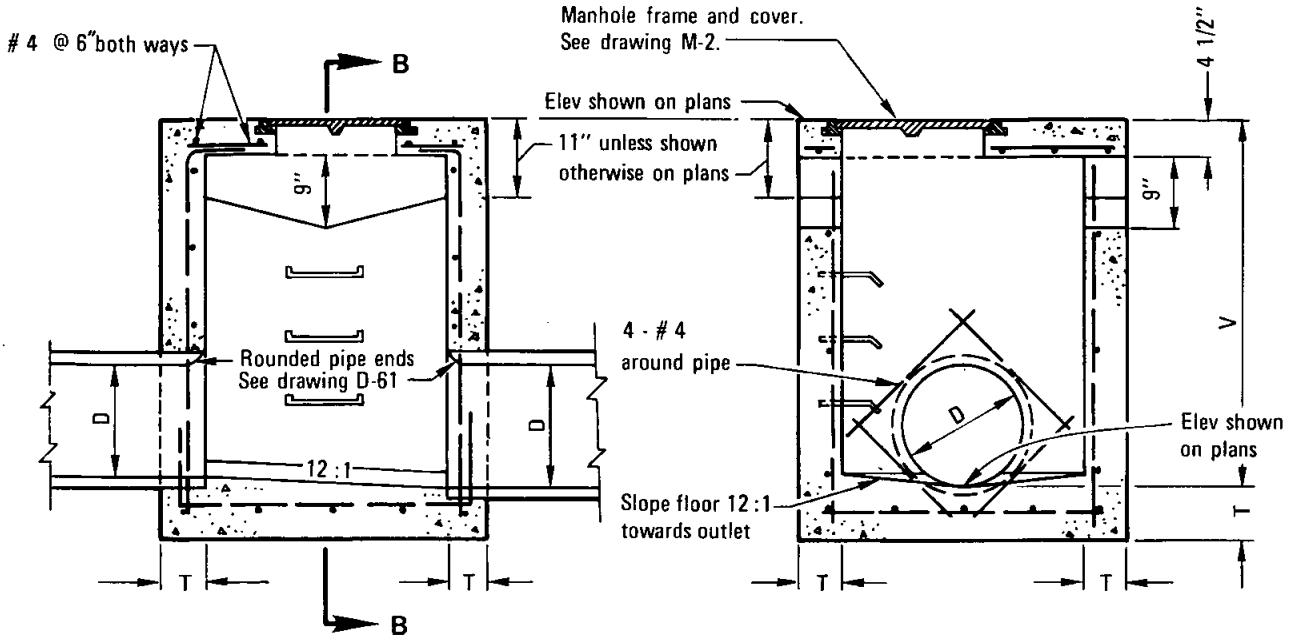
Coordinator R.C.E. 19807 — Date

SAN DIEGO REGIONAL STANDARD DRAWING

CURB INLET - TYPE E

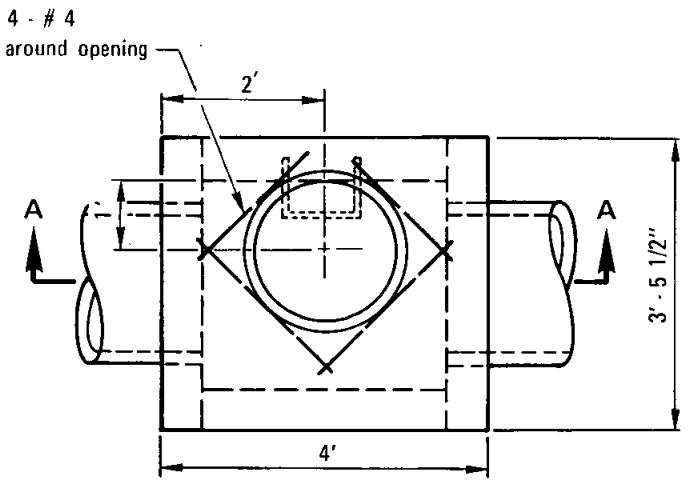
DRAWING NUMBER D-6

Revision	By	Approved	Date



SECTION A–A

SECTION B–B



PLAN

NOTES

1. See Standard Drawing D-11 for additional notes and details.
2. When V exceeds 4' steps shall be installed. See Standard Drawing D-11 for details.
3. Exposed edges of concrete shall be rounded with a radius of 1/2".
4. Openings on both sides unless otherwise shown on plans.
5. Maintain 1 1/2" clear spacing between reinforcing and surface.

LEGEND ON PLANS

Revision	By	Approved	Date

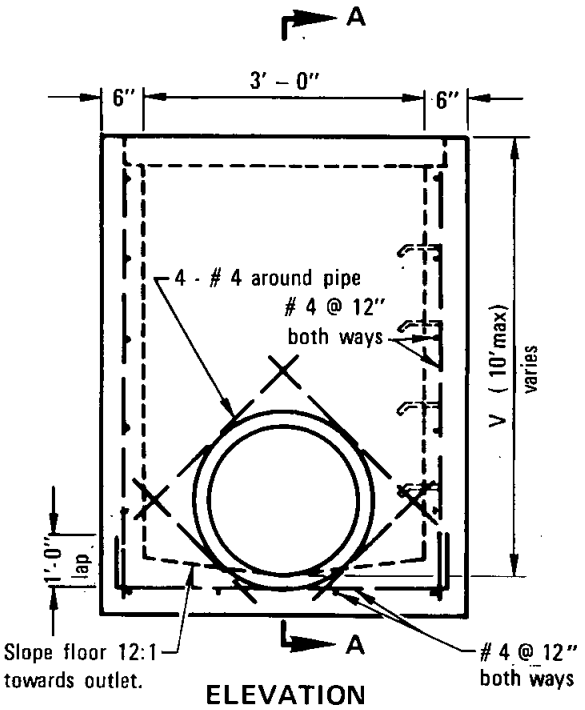
SAN DIEGO REGIONAL STANDARD DRAWING

CATCH BASIN - TYPE F

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kershaw — Coordinator R.C.E. 19807 — Dec. 1975 — Date

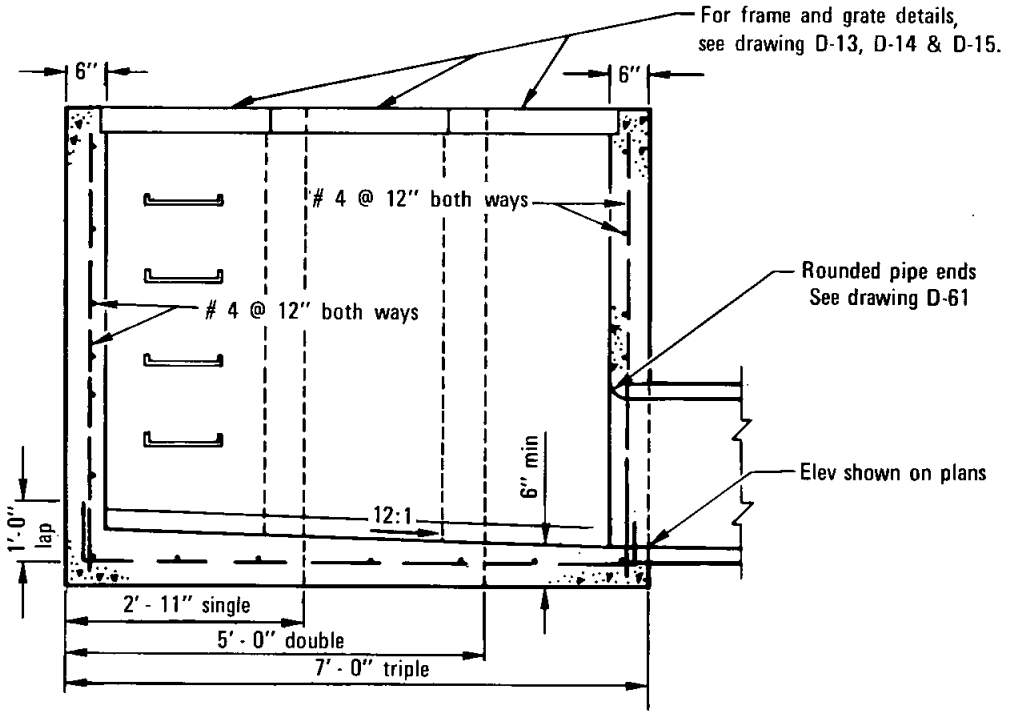
DRAWING NUMBER **D-7**



ELEVATION

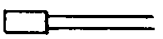
NOTES

1. See Standard Drawing D-11 for additional notes and details.
2. When V exceeds 4', steps shall be installed. See Standard Drawing D-11 for details.
3. Maintain 1 1/2" clear spacing between reinforcing and surface.
4. Increase in allowable depth subject to approval by Agency.
5. Section A–A shows 3 sizes and shall not imply that an interior wall is to be built for the structures with double or triple frame and grate.
6. Exposed edges of concrete shall be rounded with a radius of 1/2".
7. Designate types as follows: Single G-1, Double G-2 and Triple G-3.
8. Only end bearing grates shall be used, Types G-3 and G-4. See Standard Drawing D-14 and D-15.



SECTION A–A

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

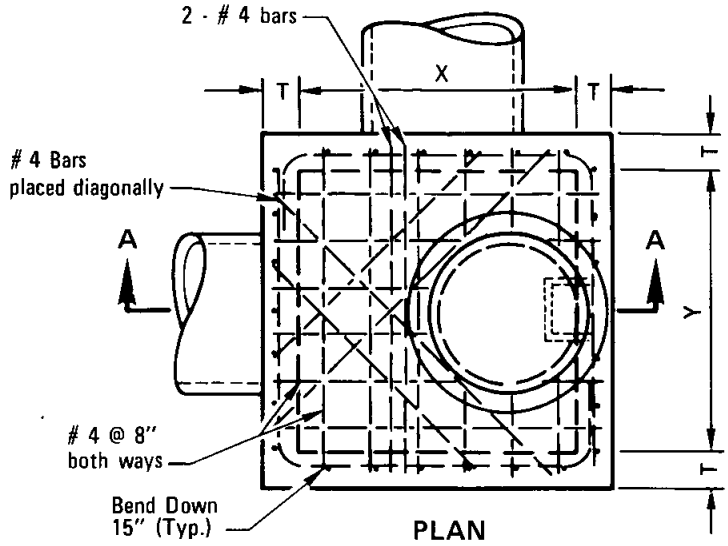
Coordinator R.C.E. 19907 — Dec. 1975 Date

DRAWING NUMBER D-8

SAN DIEGO REGIONAL STANDARD DRAWING

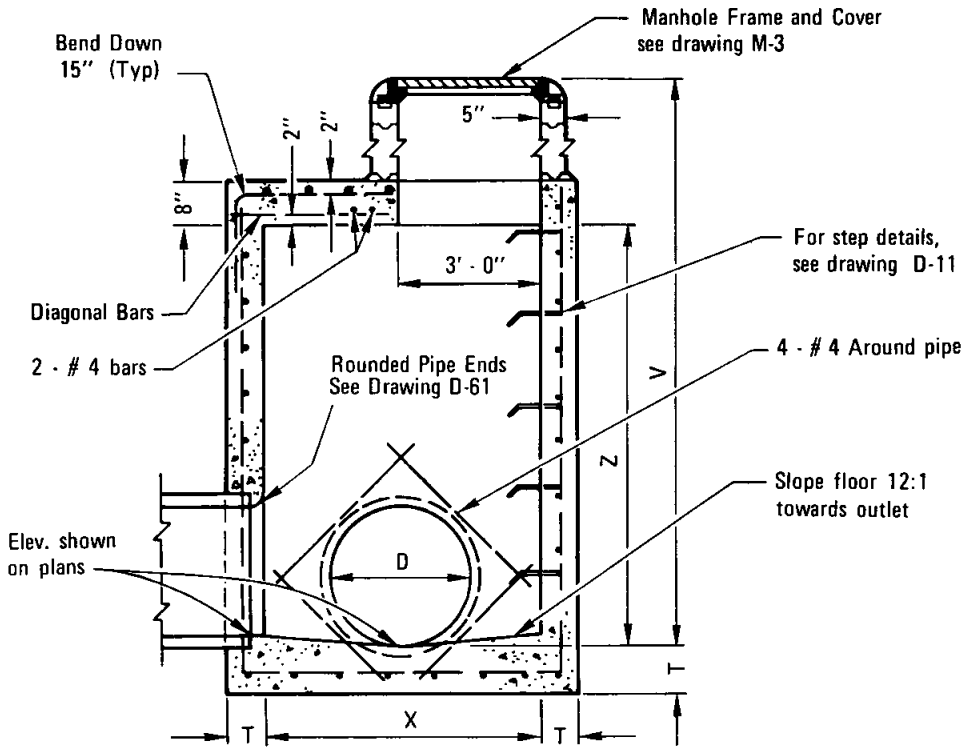
CATCH BASIN - TYPE G

Revision	By	Approved	Date



PLAN

TYPE	PIPE DIA	X	Y	Z
A 4	up to 39"	4'	4'	6'
A 5	42" to 48"	5'	4'	6'
A 6	51" to 60"	6'	4'	6'
A 7	63" to 72"	7'	4'	7'
A 8	75" to 84"	8'	4'	8'

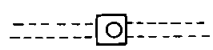


SECTION A–A

NOTES

1. See Standard Drawing D-11 for additional notes and details.
2. Concrete base shall be 564 - C - 3000.
3. All precast components shall be reinforced with 1/4" diameter steel, wound spirally on 4" centers.
4. All joints shall be set in Class C mortar.
5. Maintain 1 1/2" clear spacing between reinforcing and surface unless otherwise noted.
6. Exposed edges of concrete shall be rounded with a radius of 1/2".

LEGEND ON PLAN:



Revision	By	Approved	Date

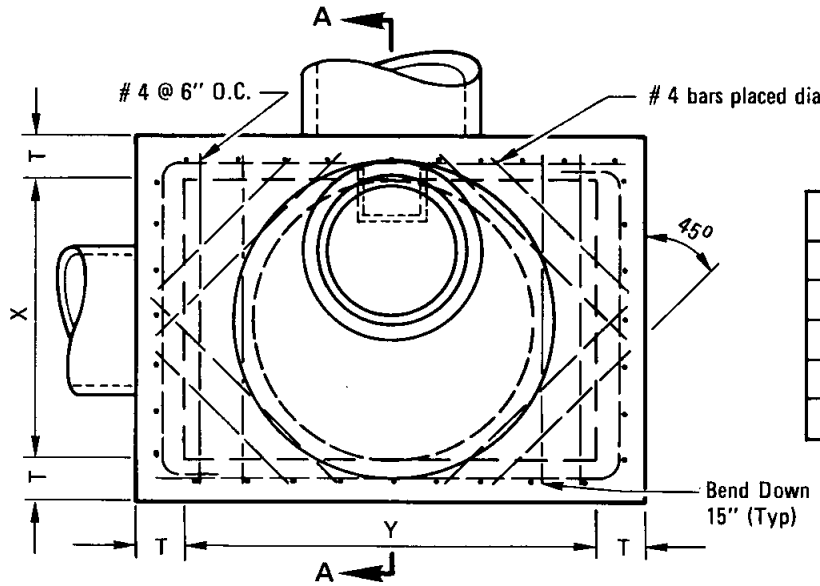
SAN DIEGO REGIONAL STANDARD DRAWING

STORM DRAIN CLEANOUT - TYPE A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

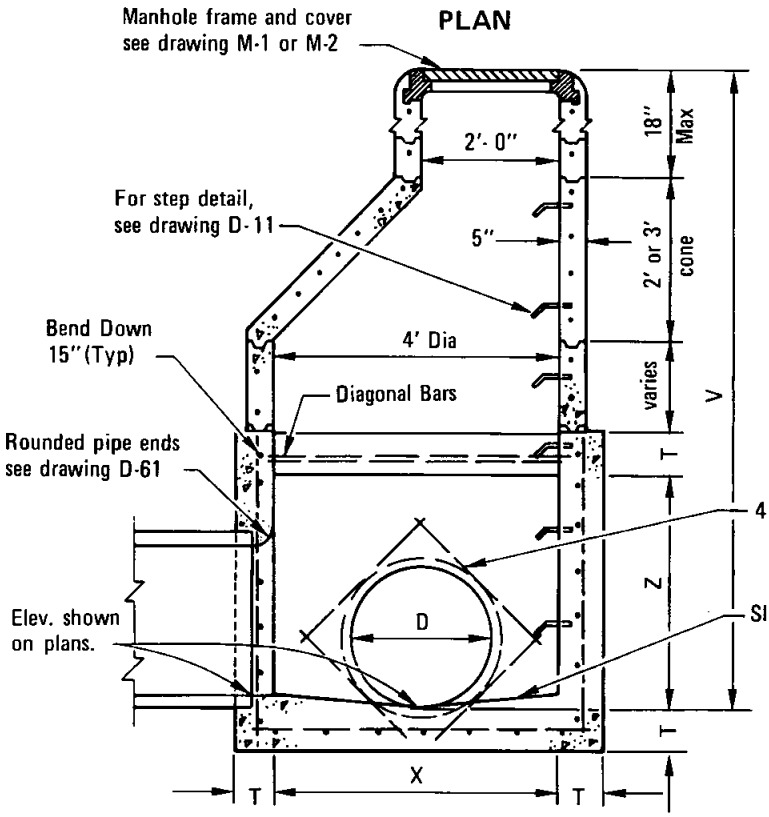
Allan A. Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **D-9**



PLAN

TYPE	PIPE DIA	X	Y	Z
B 5	up to 51"	4'	5'	5'
B 6	54" to 60"	4'	6'	6'
B 7	63" to 69"	4'	7'	7'
B 8	72" to 81"	4'	8'	8'
B 9	84" to 90"	4'	9'	9'

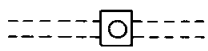


SECTION A–A

NOTES

1. See Standard Drawing D-11 for additional notes and details.
2. All joints shall be set in Class C mortar.
3. All precast components shall be reinforced with 1/4" diameter steel wound spirally on 4" centers.
4. Maintain 1 1/2" clear spacing between reinforcing and surface.
5. Concrete base shall be 564 - C - 3000.
6. Exposed edges of concrete shall be rounded with a radius of 1/2".

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

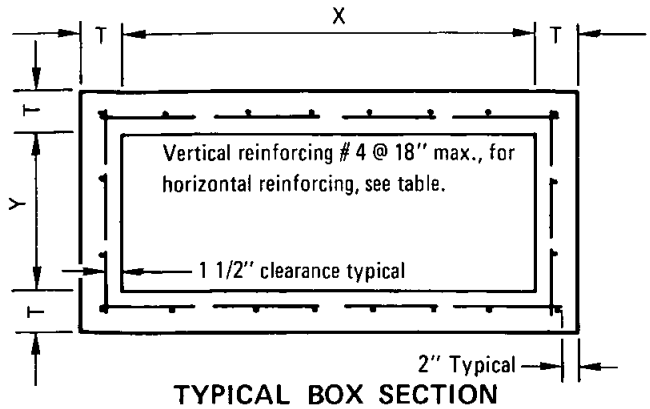
Allen A Kercheval — Coordinator R.C.E. 19807 — Dec. 1975 Date

SAN DIEGO REGIONAL STANDARD DRAWING

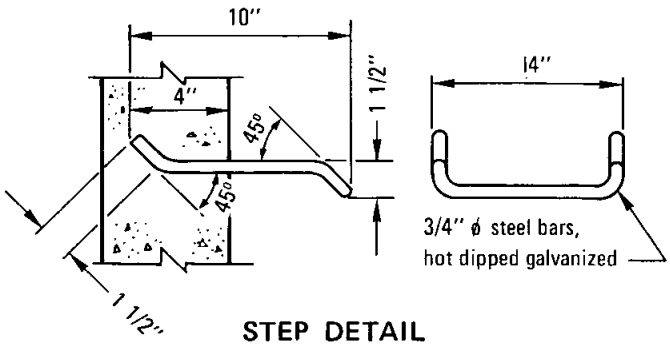
STORM DRAIN CLEANOUT - TYPE B

DRAWING NUMBER D-10

Revision	By	Approved	Date



TYPICAL BOX SECTION



STEP DETAIL

BOX SECTION REINFORCEMENT			
MAXIMUM SPAN X or Y	DEPTH V	THICK-NESS T	HOR. & FLR. REINF.
3' - 0" to 4' - 0"	4' - 0"	6"	# 4 @ 18"
4' - 1" to 7' - 0"		6"	# 4 @ 12"
7' - 1" to 8' - 0"		6"	# 4 @ 8"
3' - 0" to 4' - 0"	4' - 1" to 8' - 0"	6"	# 4 @ 18"
4' - 1" to 5' - 0"		6"	# 4 @ 12"
5' - 1" to 6' - 0"		6"	# 4 @ 8"
6' - 1" to 8' - 0"		6"	# 4 @ 6"
3' - 0" to 4' - 0"	8' - 1" to 12' - 0"	6"	# 4 @ 15"
4' - 1" to 5' - 0"		8"	# 4 @ 12"
5' - 1" to 6' - 0"		8"	# 4 @ 8"
6' - 1" to 8' - 0"		8"	# 4 @ 6"
3' - 0" to 4' - 0"	12' - 1" to 16' - 0"	6"	# 4 @ 12"
4' - 1" to 5' - 0"		8"	# 4 @ 12"
5' - 1" to 6' - 0"		8"	# 4 @ 8"
6' - 1" to 7' - 0"		8"	# 4 @ 6"
7' - 1" to 8' - 0"		8"	# 5 @ 8"
3' - 0" to 4' - 0"	16' - 1" to 20' - 0"	8"	# 4 @ 12"
4' - 1" to 5' - 0"		10"	# 4 @ 12"
5' - 1" to 6' - 0"		10"	# 4 @ 8"
6' - 1" to 7' - 0"		10"	# 4 @ 6"
7' - 1" to 8' - 0"		10"	# 5 @ 8"
3' - 0" to 4' - 0"	20' - 1" to 24' - 0"	8"	# 4 @ 12"
4' - 1" to 5' - 0"		10"	# 4 @ 12"
5' - 1" to 6' - 0"		10"	# 4 @ 8"
6' - 1" to 7' - 0"		10"	# 4 @ 6"
7' - 1" to 8' - 0"		12"	# 5 @ 8"

NOTES

1. Concrete shall be 564 - C - 3000 unless otherwise noted.
2. Reinforcing steel shall comply with this drawing unless otherwise specified.
3. Reinforcing steel shall be intermediate grade deformed bars conforming to latest ASTM specifications.
4. Bends shall be in accordance with latest ACI code.
5. Minimum splice length for reinforcing shall be 30 diameters.
6. Floor shall have a wood trowel finish and, except where used as junction boxes, shall have a minimum slope of 1" per foot toward the outlet.
7. Depth V is measured from the top of the structure to the flowline of the box.
8. Wall thickness and reinforcing steel required may be decreased in accordance with table above.
9. Wall thickness shall be stepped on the outside of the box.
10. When the structure depth V exceeds 4', steps shall be cast into the wall at 15 inch intervals from 15" above floor to within 12 inches of top of structure. Where possible place steps in wall without pipe opening, otherwise over opening of smallest diameter.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

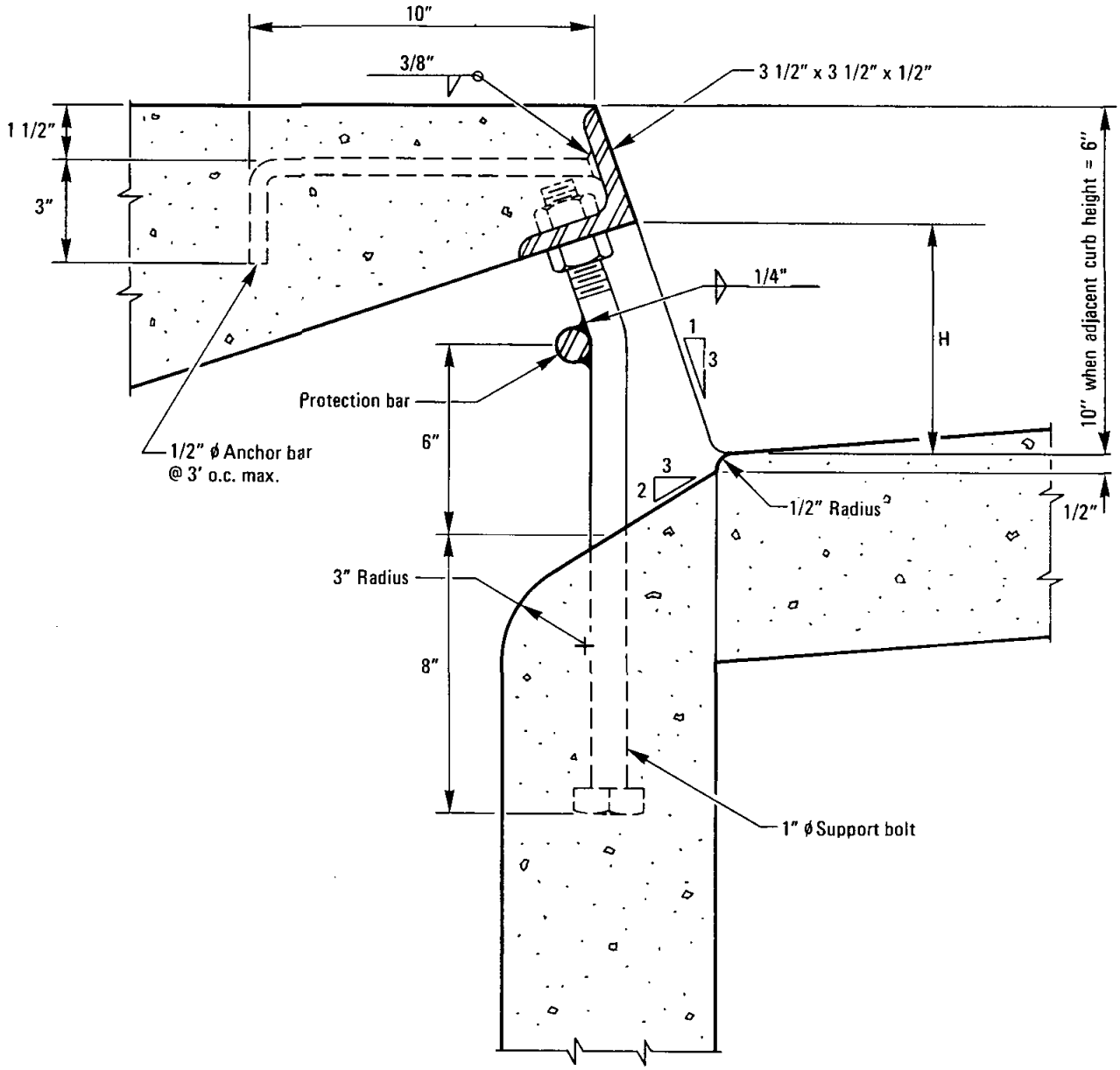
INLETS AND CLEANOUTS NOTES AND DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel — Dec. 1975

Coordinator R.C.E. 19807 — Date

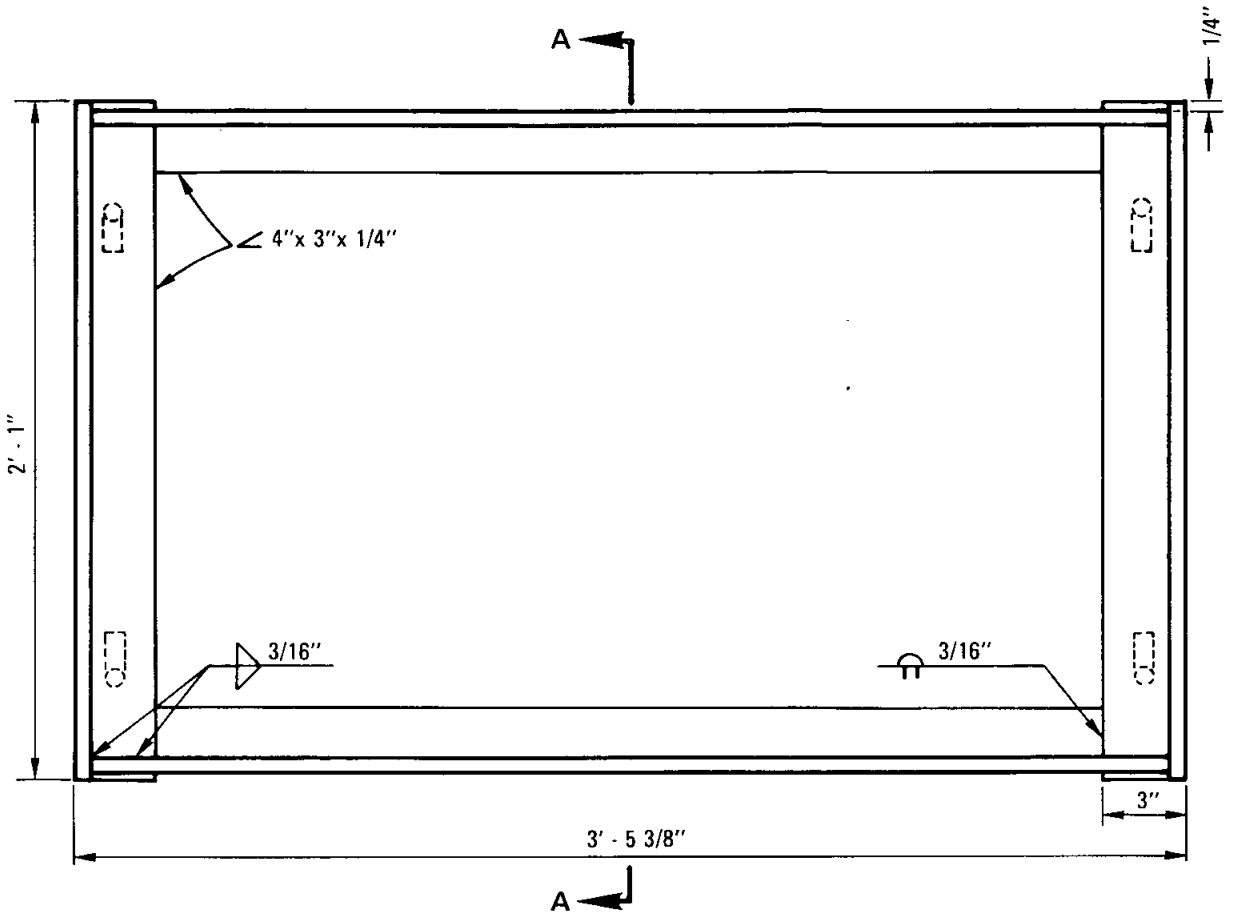
DRAWING NUMBER **D-11**



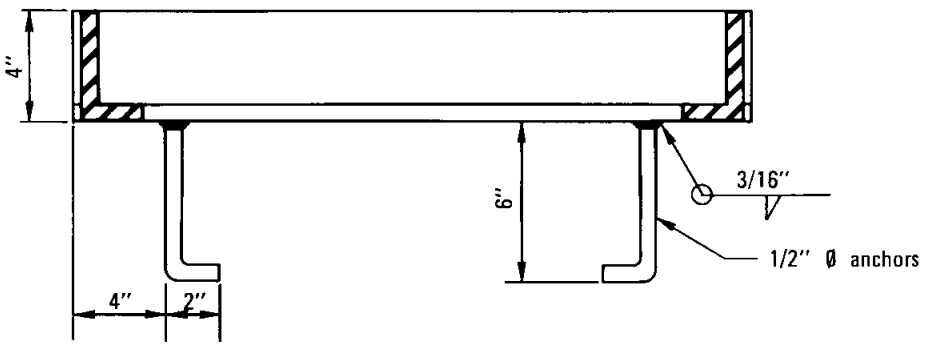
NOTES:

1. Face angle shall be cast into structure continuous for the full length "L".
2. All exposed metal parts to be hot-dipped galvanized after fabrication.
3. When curb inlet opening height (H) exceeds 6" install 1" ø steel protection bar.
4. Install additional bars at 3 1/2" clear spacing above first bar when opening exceeds 13".
5. When curb inlet opening length exceeds 8' install 1" ø steel support bolts, spaced at not more than 5' o.c.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE Allan A Kenchmark Dec. 1975 Coordinator R.C.E. 19807 Date	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
DRAWING NUMBER D-12	CURB INLET OPENING				



PLAN



SECTION A–A

Revision	By	Approved	Date

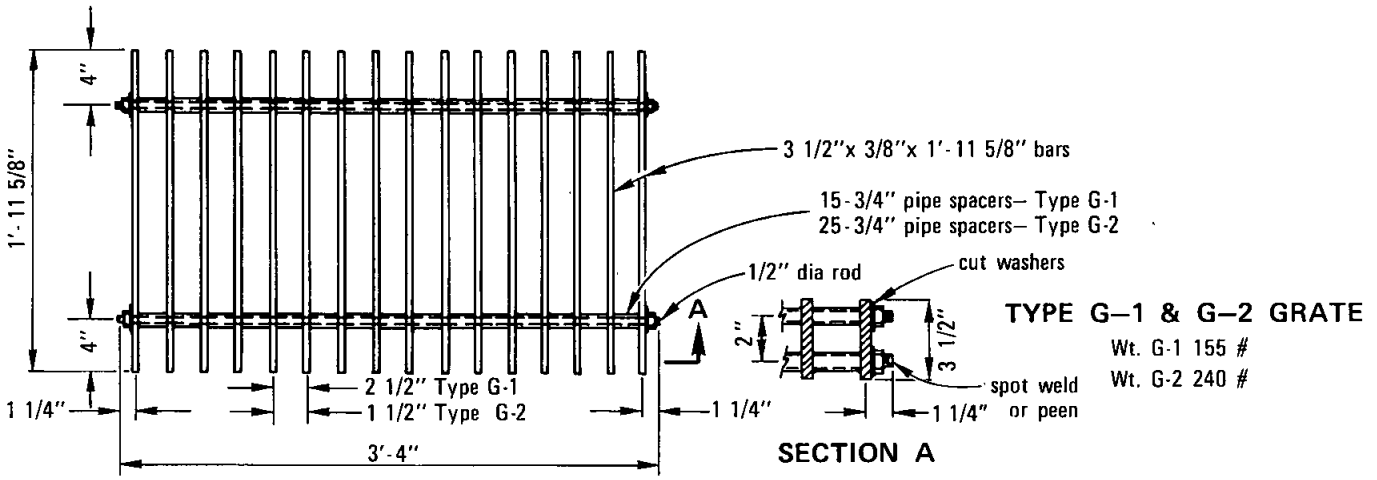
SAN DIEGO REGIONAL STANDARD DRAWING

WELDED STEEL GRATE FRAME

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

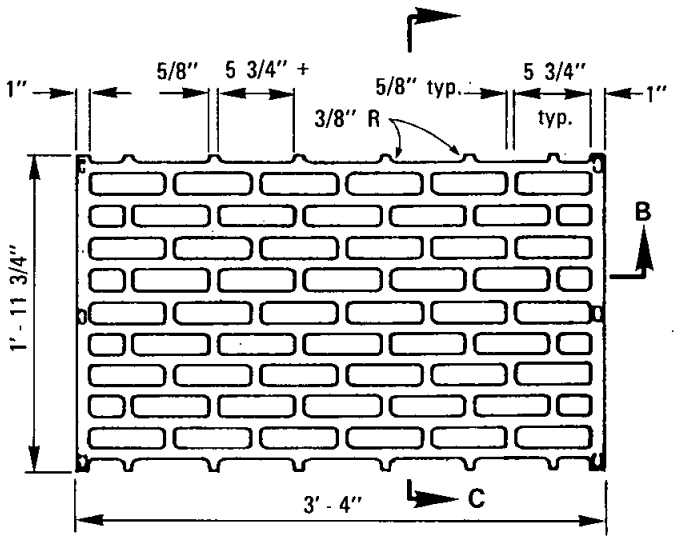
DRAWING NUMBER **D-13**



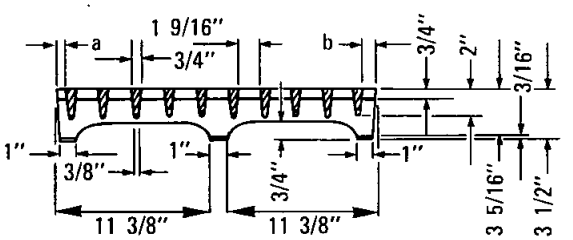
TYPE G–1 & G–2 GRATE

Wt. G-1 155 #
Wt. G-2 240 #

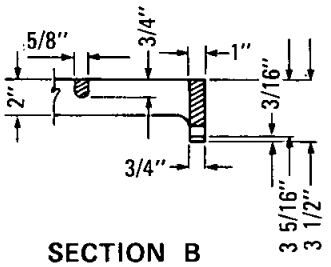
SECTION A



TYPE G–3 GRATE
(CAST NODULAR IRON)
Wt. 155 #



SECTION A–A

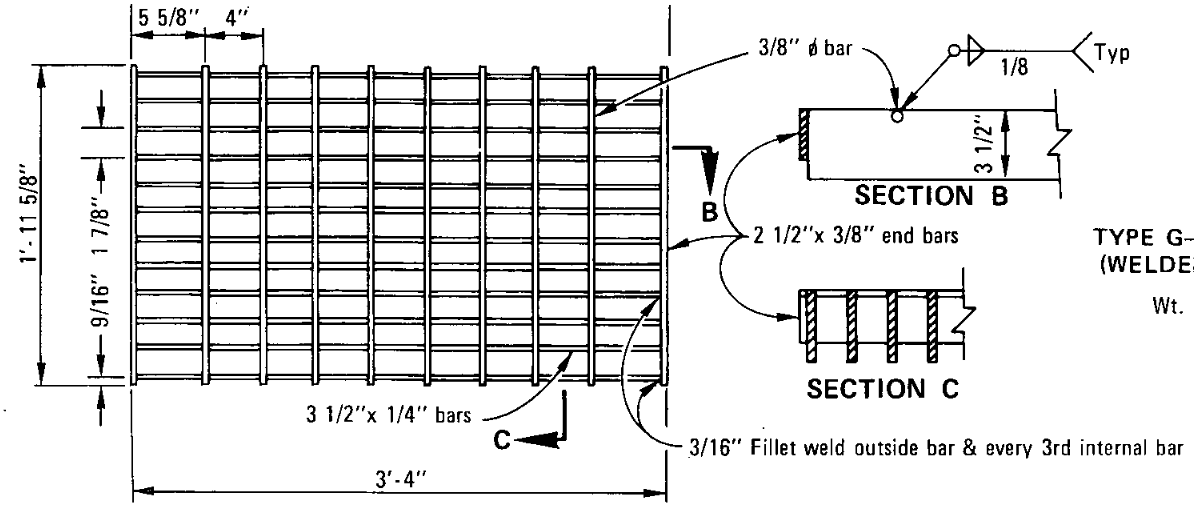


SECTION B

NOTES:

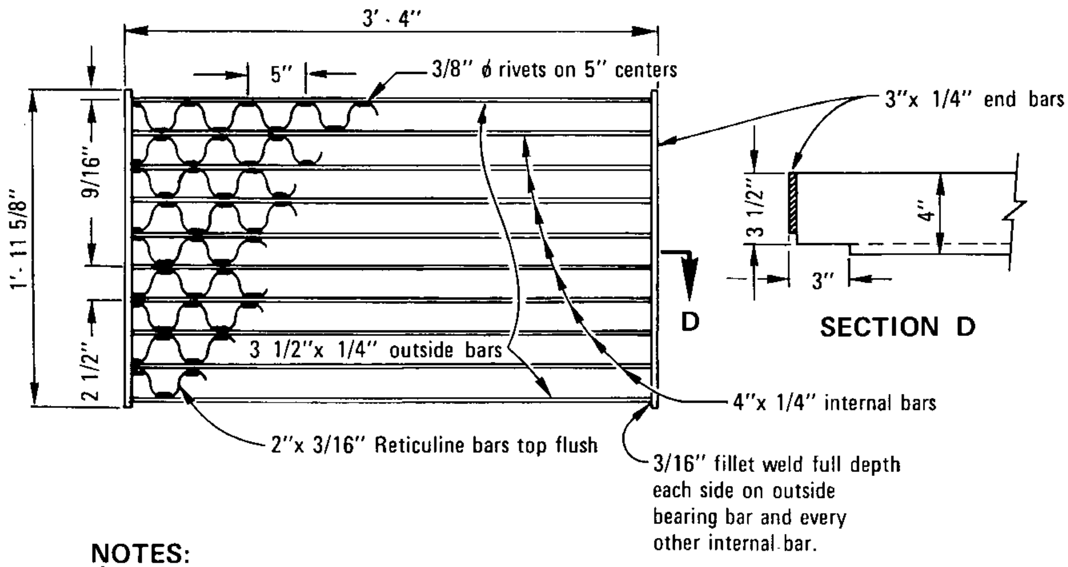
1. Hot dip galvanize all parts after fabrication.
2. Dimensions to Centerline of bars unless otherwise noted.
3. Type G-1 and G-2 grates are not to be used in areas subject to bicycle traffic.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE Coordinator R.C.E. 19807 Date: Dec. 1975	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
	DRAINAGE STRUCTURE GRATES TYPES G1, G2 AND G3				
DRAWING NUMBER **D-14**					



TYPE G–4 GRATE
(WELDED STEEL)

Wt. 141 #



TYPE G–5 GRATE
(RETICULINE TYPE)

Wt. 182 #

NOTES:

1. Hot dip galvanize all parts after fabrication.
2. Dimensions to Centerline of bars unless otherwise noted.

Revision	By	Approved	Date

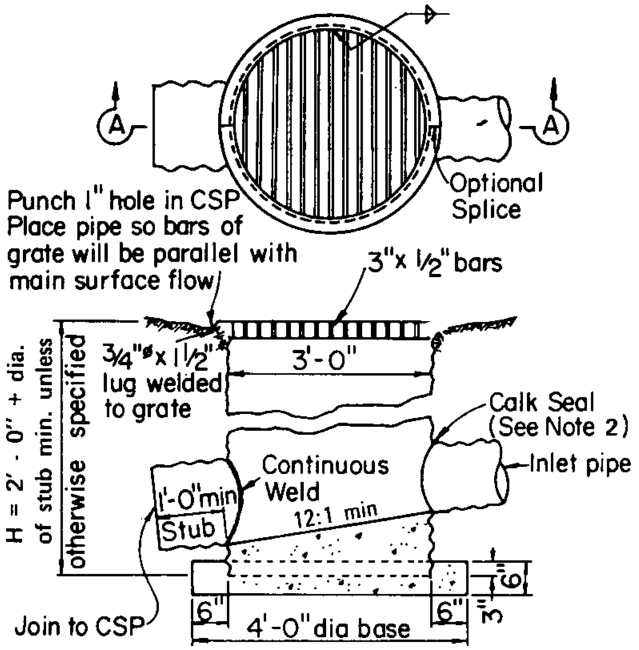
SAN DIEGO REGIONAL STANDARD DRAWING

DRAINAGE STRUCTURE GRATES TYPES G4 AND G5

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

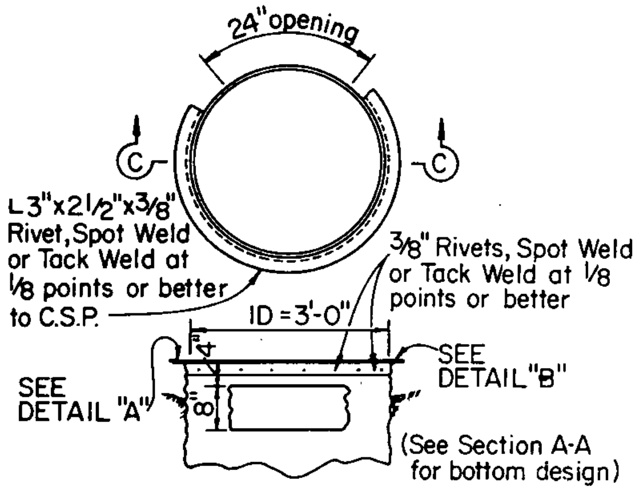
Allard A. Keuhlmuel   Dec. 1975
Coordinator R.C.E. 19807   Date

DRAWING NUMBER **D-15**



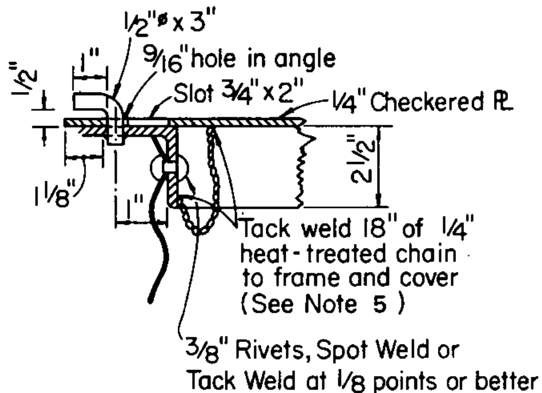
SECTION A-A

TYPE A

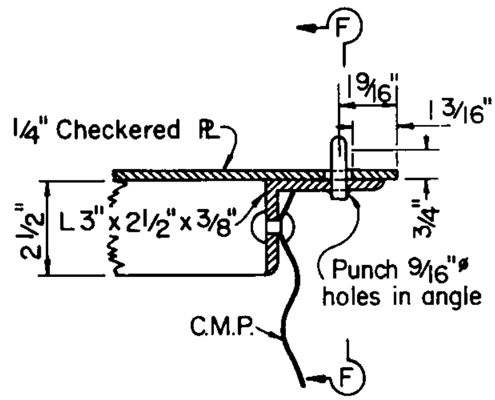


SECTION C-C

TYPE B



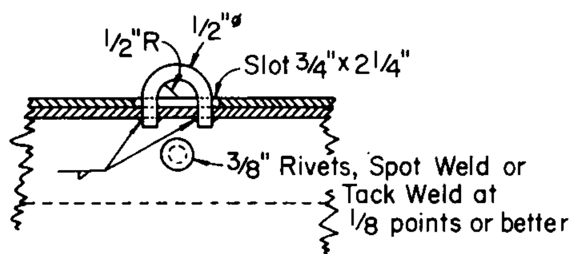
DETAIL "A"



DETAIL "B"

NOTES

1. Structure shall be galvanized and asphalt dipped.
2. Inlet and outlet pipes shall be set at factory and positioned as shown on plans.
3. Ladders and Steps: None required where "H" is 3'-6" or less. Where "H" is between 3'-6" and 4'-11" place one step +16" above the floor. If "H" is 5'-0" or more install a ladder placing the lowest rung 16" above the floor and the highest rung not more than 14" below top of inlet. Place single step or ladder in wall without wall opening.
4. See Standard Drawing D-17 for additional details.
5. Grate to be provided when specified.
6. Modify grate where bycicle traffic may occur.



SECTION F-F

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

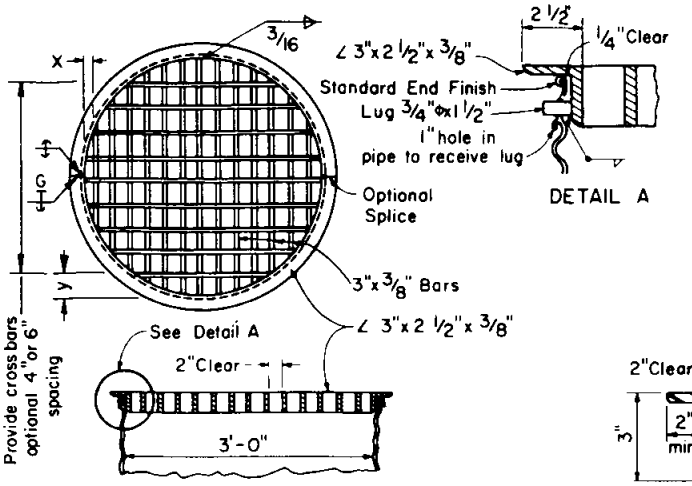
Allen A. Kercheval — Dec. 1975
Coordinator R.C.E. 19807 — Date

SAN DIEGO REGIONAL STANDARD DRAWING

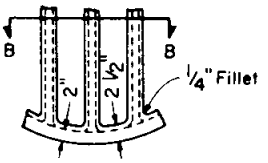
CORRUGATED STEEL PIPE INLETS
TYPES A AND B

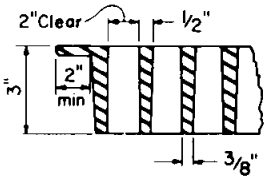
DRAWING NUMBER **D-16**

Revision	By	Approved	Date

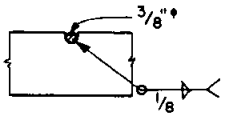


GRATE DETAILS



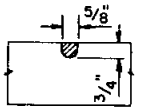


ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL



3/8"ϕ Cross bars may be fillet welded, resistance welded or electroforged to bearing bars.

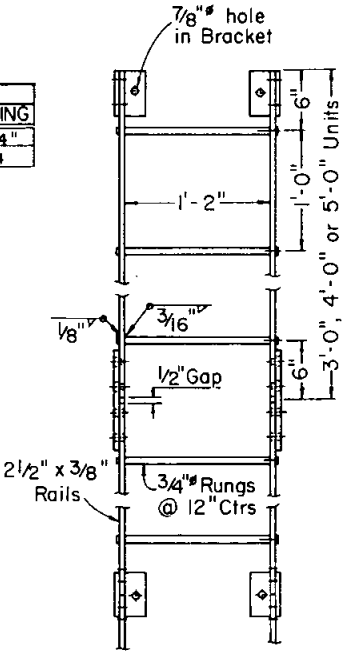
CROSS BAR DETAIL
GRATE (WELDED STEEL)

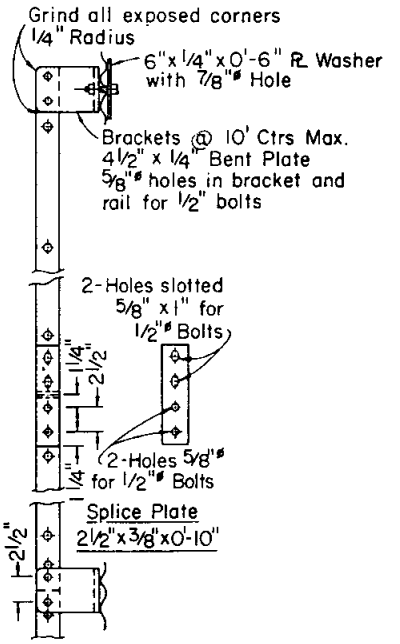


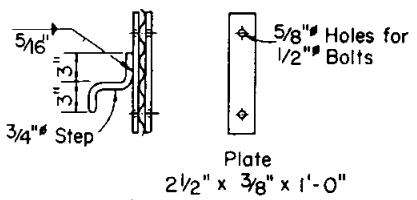
CROSS BAR DETAIL
ALTERNATIVE CAST NODULAR IRON GRATE OR CAST STEEL GRATE

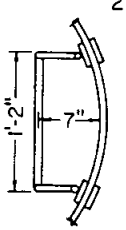
GRATE BAR SPACING TABLE

TYPE	NO. BARS	CLEAR BAR SPACING	X	y 4"SPACING	y 6"SPACING
welded	15	2	9/16	3 3/4"	5 3/4"
Cast	13	2	2 1/8	3 3/4	5 3/4

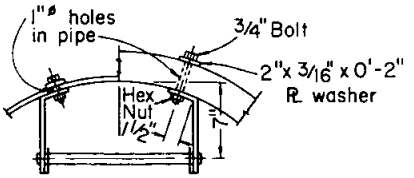








STEP DETAIL
H = 3' - 6" to 4' - 11"



LADDER DETAIL
H = 5' - 0" or GREATER

Revision	By	Approved	Date

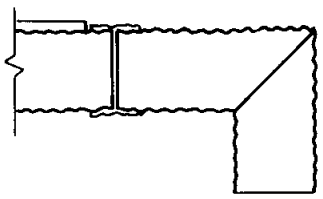
SAN DIEGO REGIONAL STANDARD DRAWING

CORRUGATED STEEL PIPE INLETS DETAILS

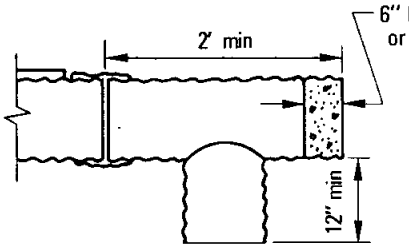
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kaufman — Dec. 1975
Coordinator R.C.E. 19807 — Date

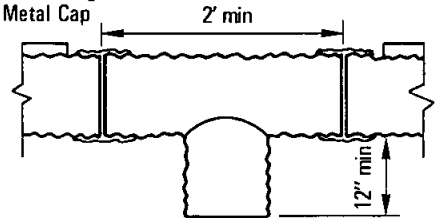
DRAWING NUMBER **D-17**



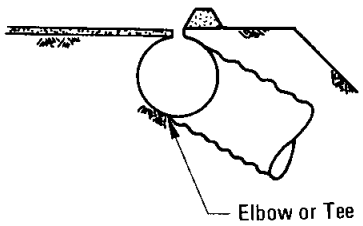
ELBOW



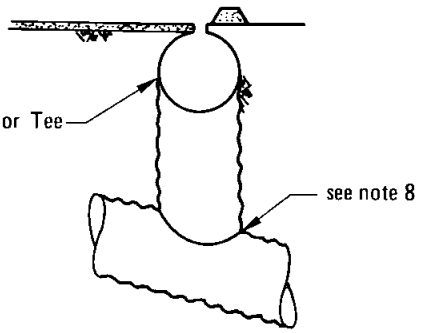
TEE



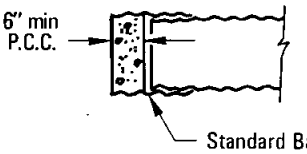
TEE–SAG CONDITION



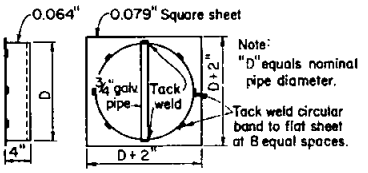
OVERSIDE DRAIN



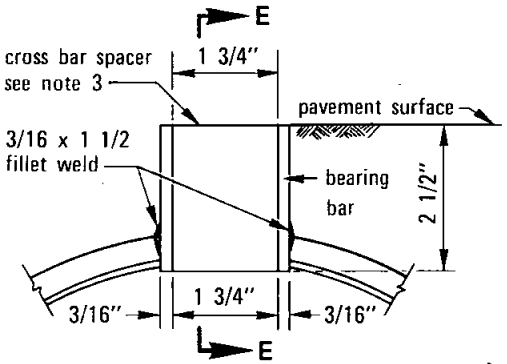
RISER



BAND PLUG

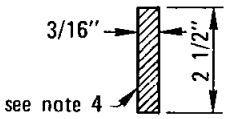


METAL CAP DETAIL

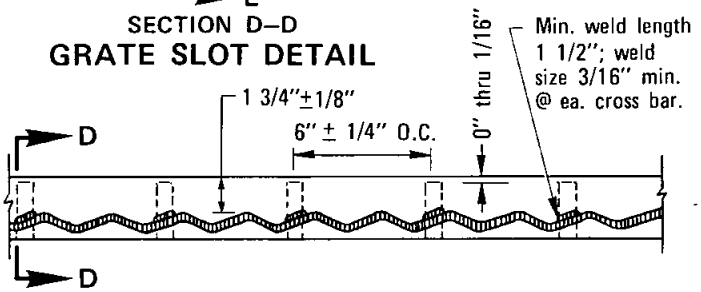


SECTION D–D

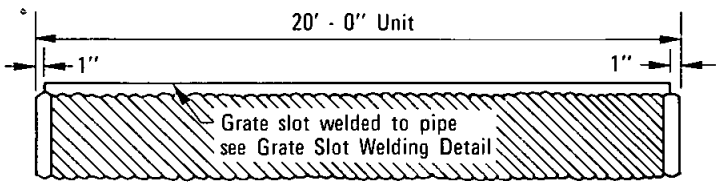
GRATE SLOT DETAIL



SECTION E–E



GRATE SLOT WELDING DETAIL



GRATE SLOT DRAIN

NOTES

1. Drain seams may be riveted or resistance spotwelded at equal centers, continuous helical lock seam or helical welded seam.
2. Each drain section shall be assembled with standard coupling bands.
3. Cross bar spacer of grate shall be pressure fusion or plug welded to bearing bars in such a manner as to develop the strength of the cross bar spacer.
4. Cross bar spacer (Section E–E) may differ from that shown provided section area is equal or greater.
5. Grate material shall be a weldable grade of steel complying to the requirements of ASTM A 36.
6. The maximum variance from a straight line from the extreme top corners of the bearing bar shall be 1/2" in 20 feet.
7. Installation lengths shall be 10 feet or multiples thereof.
8. Either field joint sealed with a pliable mixture of sand, portland cement and emulsified asphalt (Mixture of 1 part portland cement, 3 - 5 parts sand and 1 1/2 parts SSI emulsified asphalt), or continuous weld.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

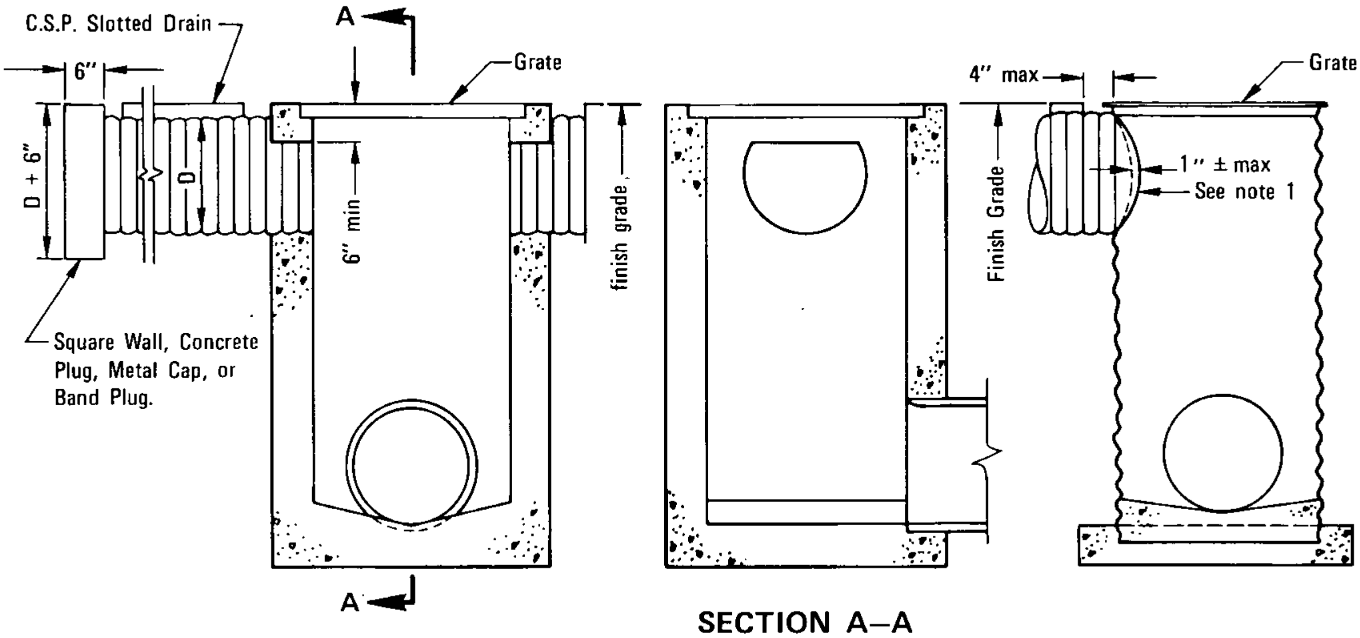
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

SLOTTED CORRUGATED STEEL PIPE DRAIN 12" THROUGH 24"

DRAWING NUMBER **D-18**

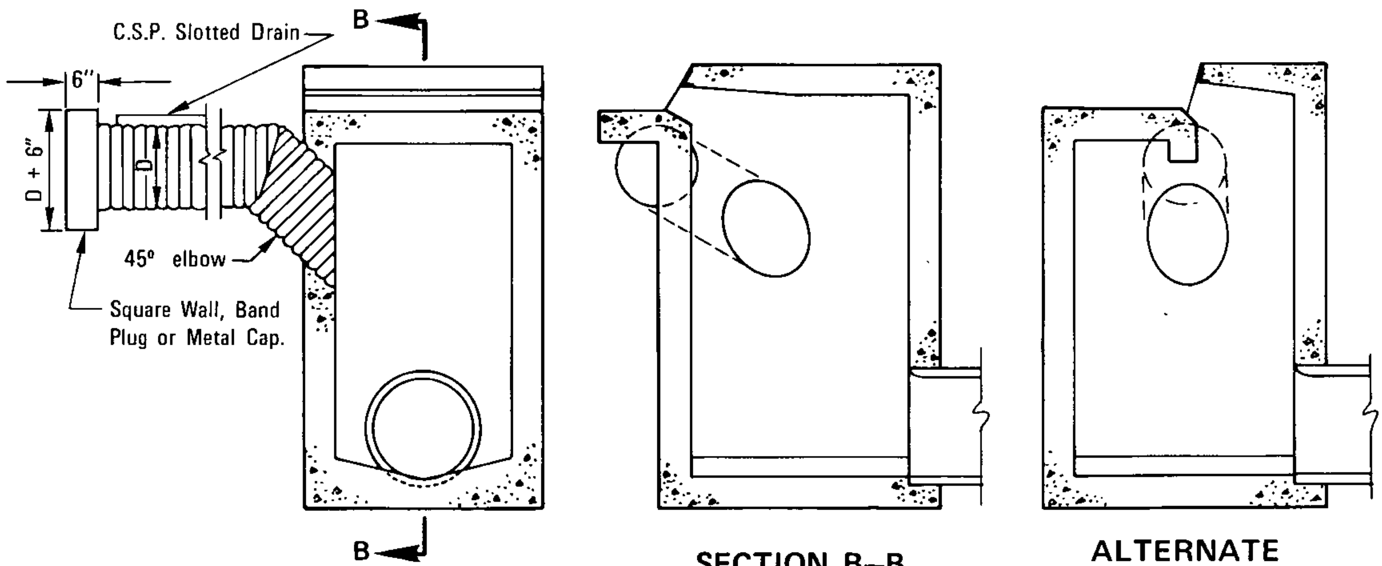
Revision	By	Approved	Date



SECTION A–A

CATCH BASIN

C.S.P. INLET



SECTION B–B

ALTERNATE SECTION B–B

INLETS

NOTES

1. Either field joint with a pliable mixture of sand, portland cement and emulsified asphalt (mixture of 1 part portland cement, 3 - 5 parts sand, and 1 1/2 parts SSI emulsified asphalt), or continuous weld.
2. See Standard Drawing D - 18 for additional notes and details.

Revision	By	Approved	Date

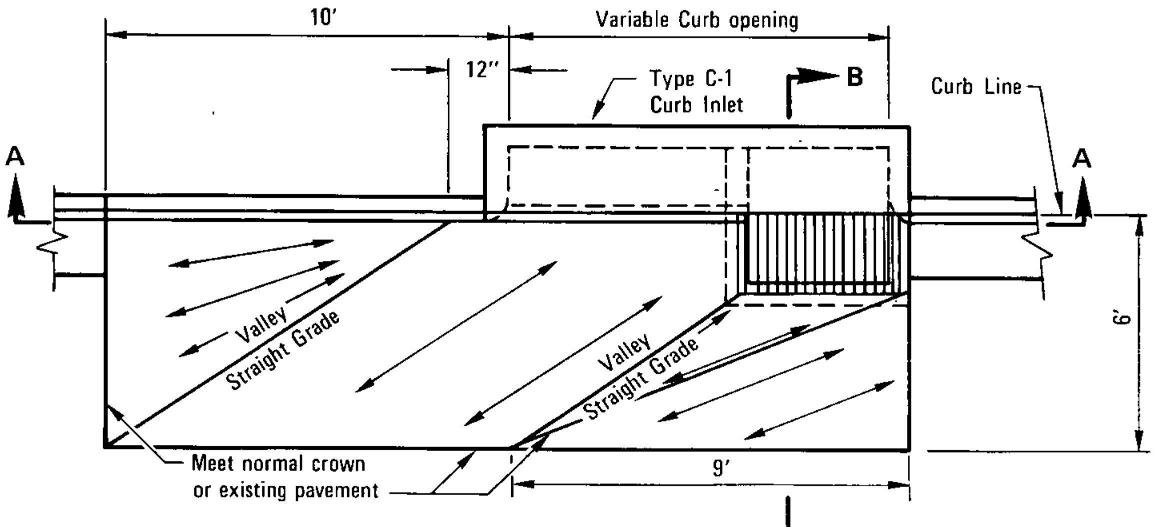
SAN DIEGO REGIONAL STANDARD DRAWING

SLOTTED DRAIN CONNECTIONS TO STANDARD INLETS

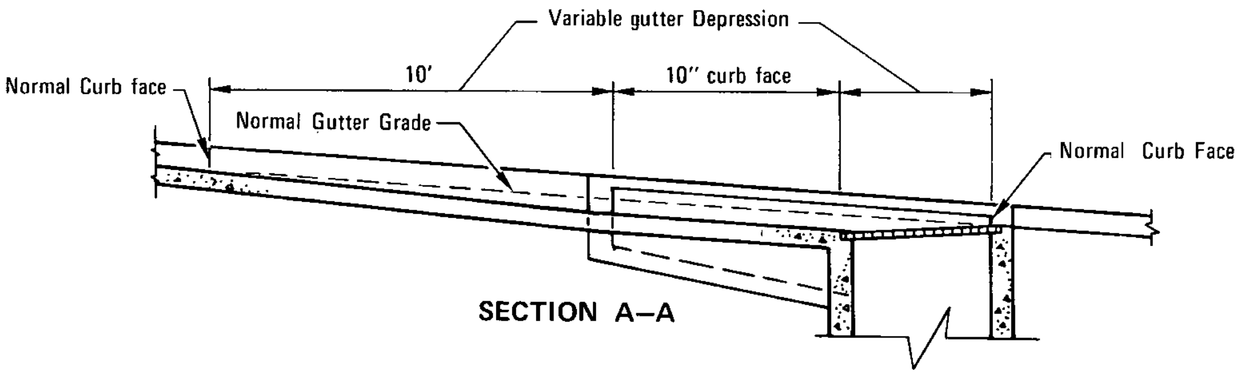
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allard A. Kirchner (signature) Dec. 1975
Coordinator R.C.E. 19807 Date

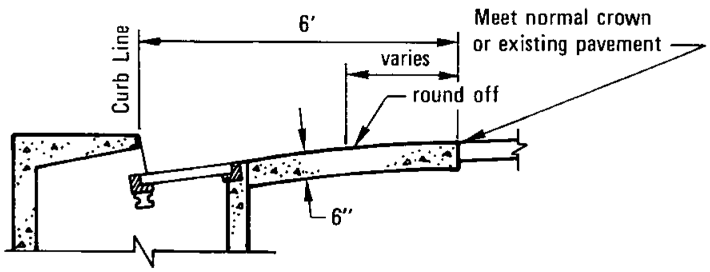
DRAWING NUMBER **D-19**



PLAN



SECTION A–A

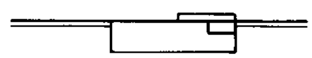


SECTION B–B

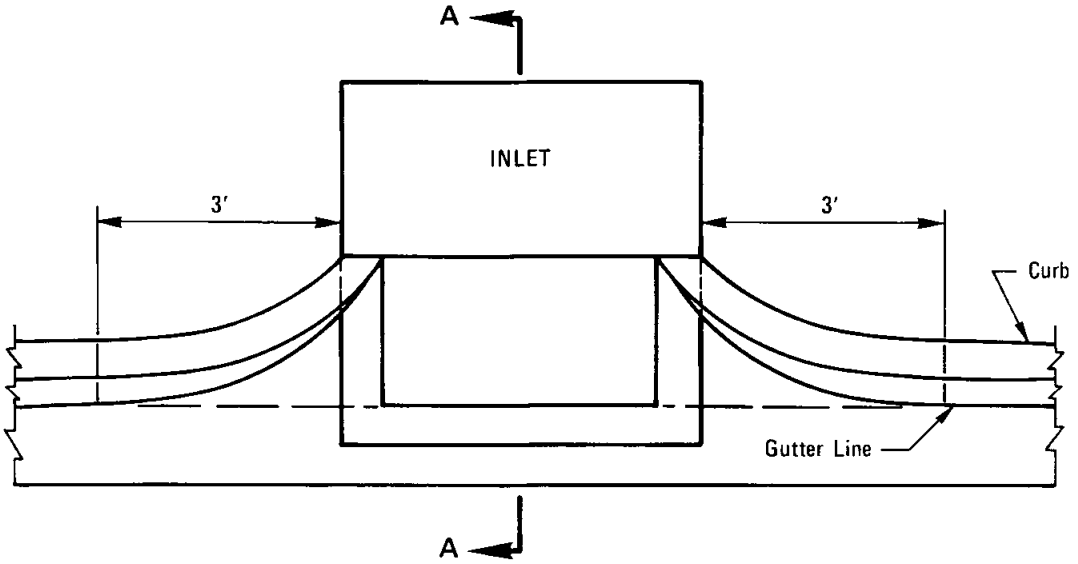
NOTES:

1. Curb and apron to be placed monolithically.
2. Use of false header at valleys and slope break line is optional.
3. Extend vertical steel from inlet structure into concrete apron as required.
4. Screed Direction ⟷
5. Concrete shall be 517-C-2500.

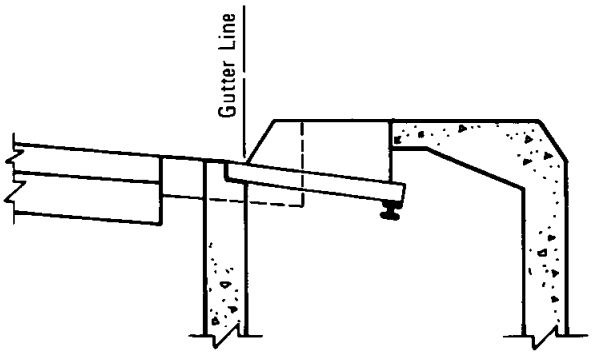
LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
Allan A. Kerchner (signature), Dec. 1975 Coordinator R.C.E. 19807 Date	CONCRETE APRON FOR CURB INLET				
DRAWING NUMBER D-20					



PLAN



SECTION A–A

NOTES

1. Fit curb to the face of inlet wall.
2. For use with Type C inlet only. See Standard Drawing D-3 for details.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

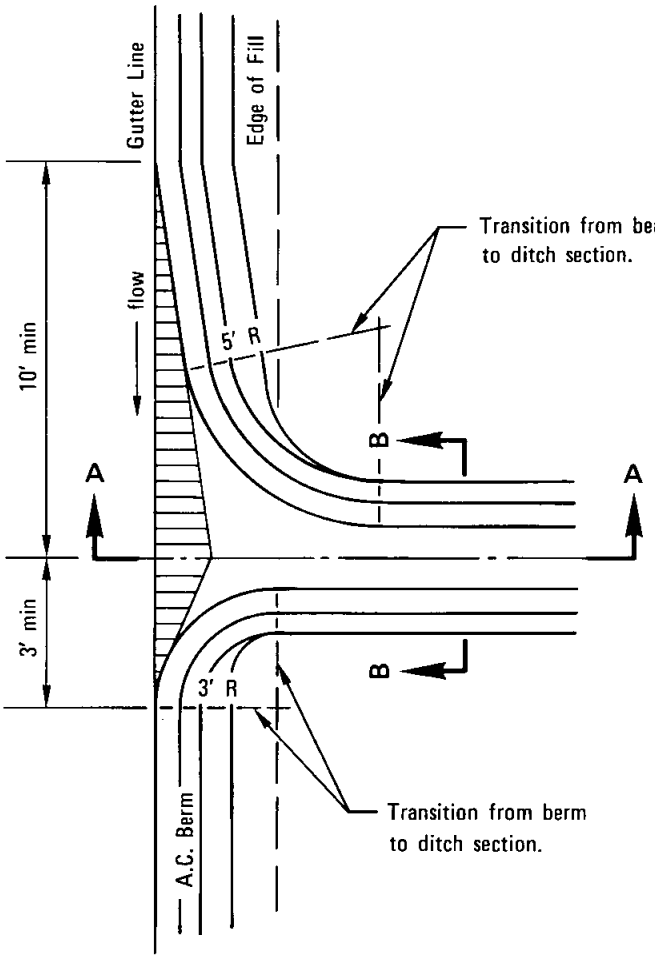
CURB RETURN FOR MEDIAN STRIP INLETS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

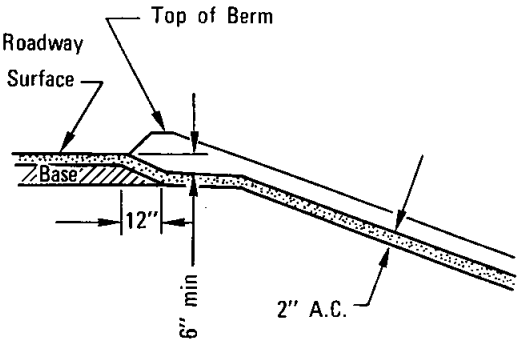
Allen A Kruckemeyer — Dec. 1975

Coordinator R.C.E. 19807 — Date

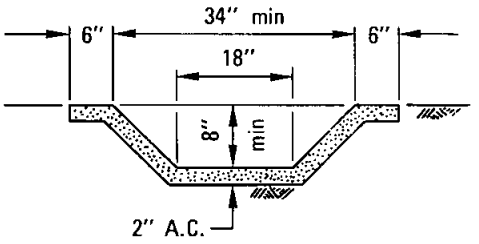
DRAWING NUMBER **D-21**



PLAN



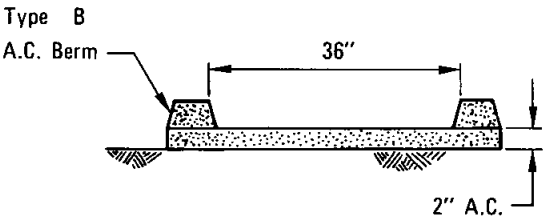
SECTION A–A



NOTE

Cross - sectional area of ditch may be rounded, or trapezoidal.

SECTION B–B

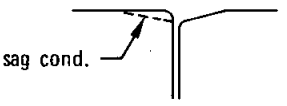


ALTERNATE SECTION B–B

NOTES

1. A.C. spillway may be used when fill is 10' or less, and where fill slope is 1 1/2:1 or flatter.
2. Use 10' min. length of gutter transition on each side of downdrain in sag condition.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

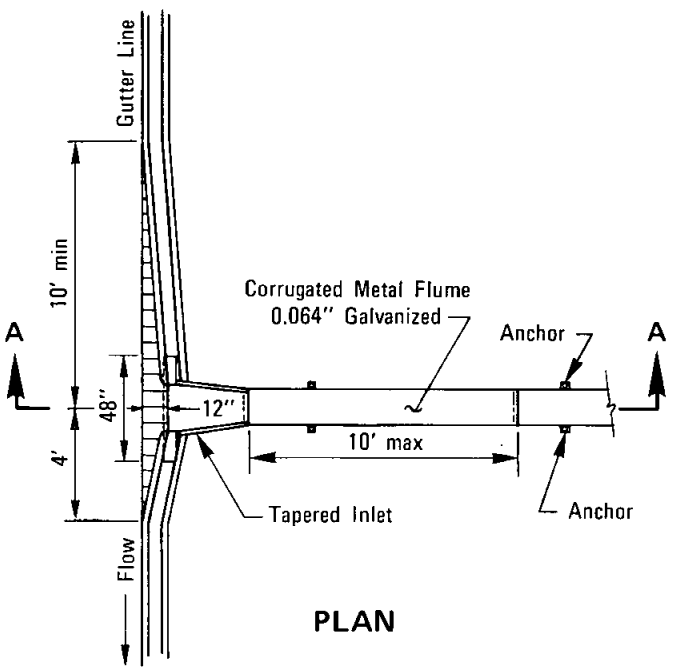
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

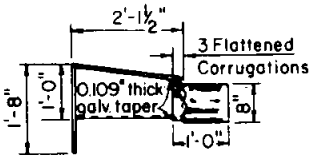
ASPHALT CONCRETE SPILLWAY

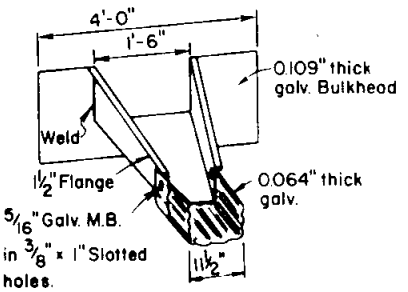
DRAWING NUMBER D-22

Revision	By	Approved	Date

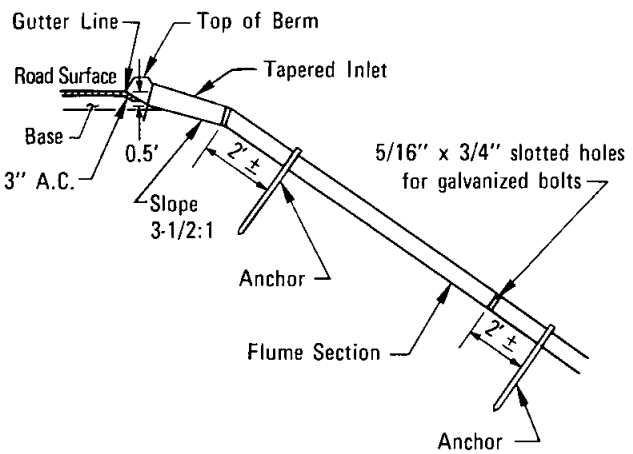


PLAN

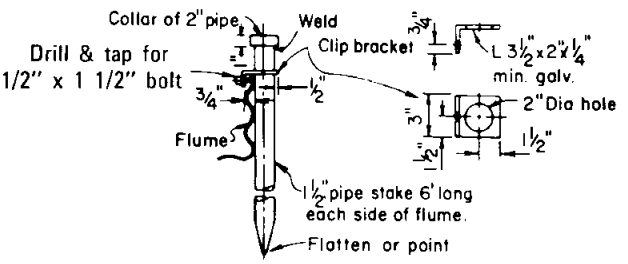




TAPERED INLET



SECTION A–A

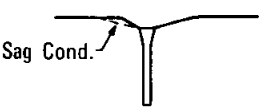


ANCHOR DETAIL

NOTES

1. Downdrain flume may be used where fill slope is 1 1/2 : 1 or flatter.
2. Use 10' min length of gutter transition on each side of downdrain in sag location.
3. All metal parts to be galvanized after fabrication.

LEGEND ON PLANS



Revision	By	Approved	Date

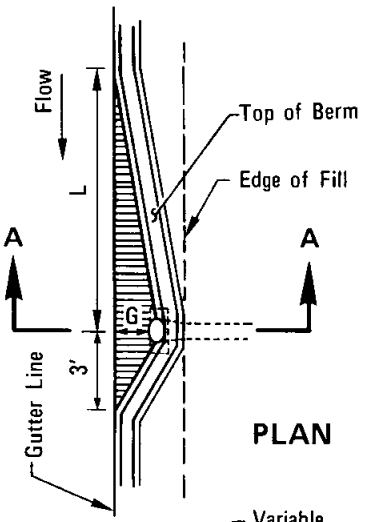
SAN DIEGO REGIONAL STANDARD DRAWING

TAPERED INLET AND DOWNDRAIN FLUME

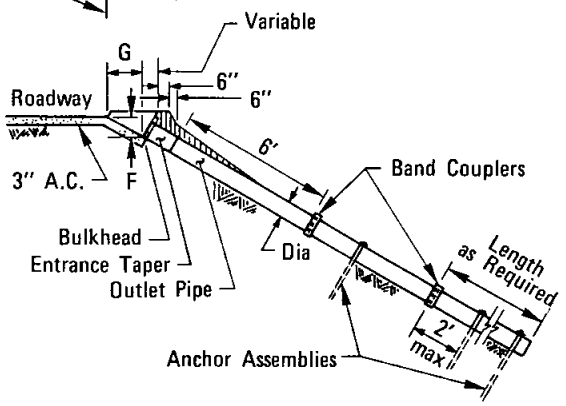
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

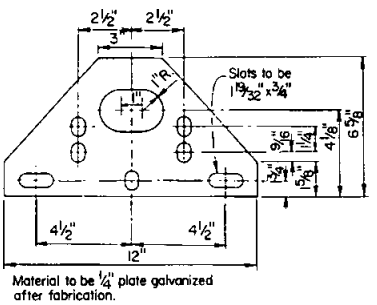
DRAWING NUMBER **D-23**



PLAN

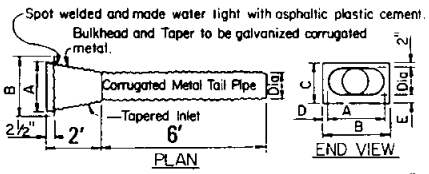


SECTION A–A



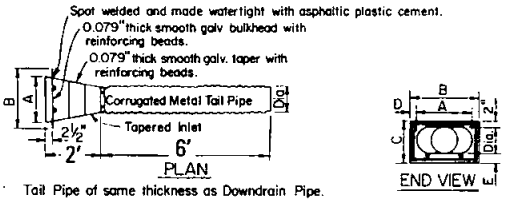
Material to be ¼" plate galvanized after fabrication.

PLATE DETAIL



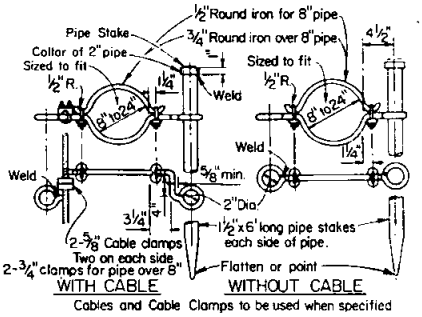
Bulkhead and Taper of same thickness as Tail Pipe with 0.079" Max. Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER– TYPE 1 ALTERNATIVE A



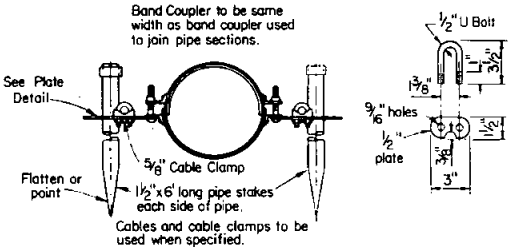
Tail Pipe of same thickness as Downdrain Pipe.

ENTRANCE TAPER–TYPE 1 ALTERNATIVE B



Cables and Cable Clamps to be used when specified

ANCHOR ASSEMBLY ALTERNATIVE–A



Cables and cable clamps to be used when specified.

ANCHOR ASSEMBLY ALTERNATIVE–B

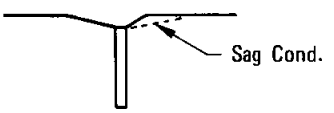
Dimensions to be as tabulated below for Assembly.

Dia	A	B	C	D	E	F	G	L
8"	16"	25 1/2"	15"	4 3/4"	5"	6"	18"	10'
12"	18"	25 1/2"	19"	3 3/4"	5"	9"	20"	15'
18"	24"	36"	26"	6"	6"	12"	24"	25'

NOTES

1. All metal parts for anchor assemblies shall be galvinized after fabrication.
2. One anchor assembly required per length of pipe. When final length exceeds 10 ft. two anchors shall be required.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

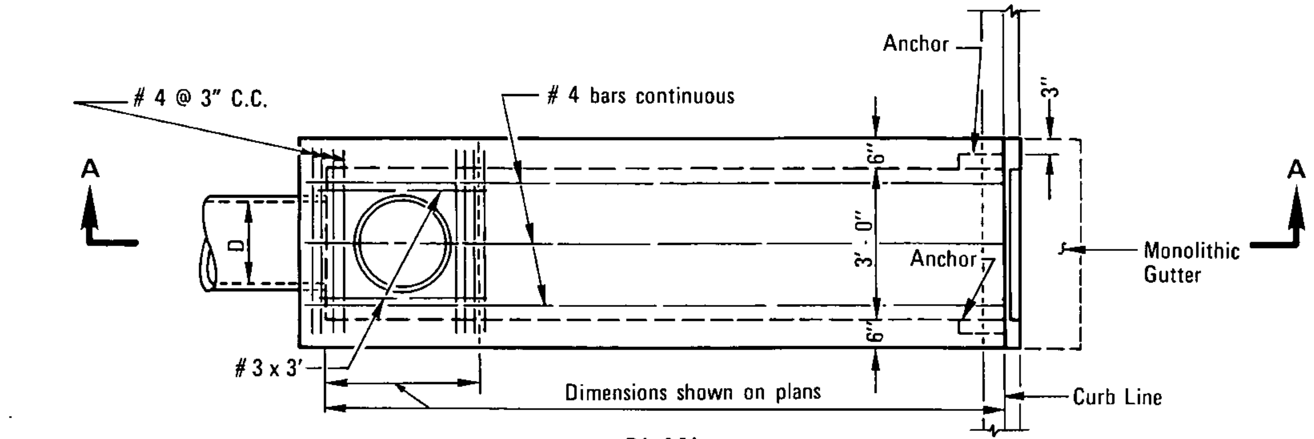
Allan A. Kruckeberg — Dec. 1975
Coordinator R.C.E. 19807 — Date

SAN DIEGO REGIONAL STANDARD DRAWING

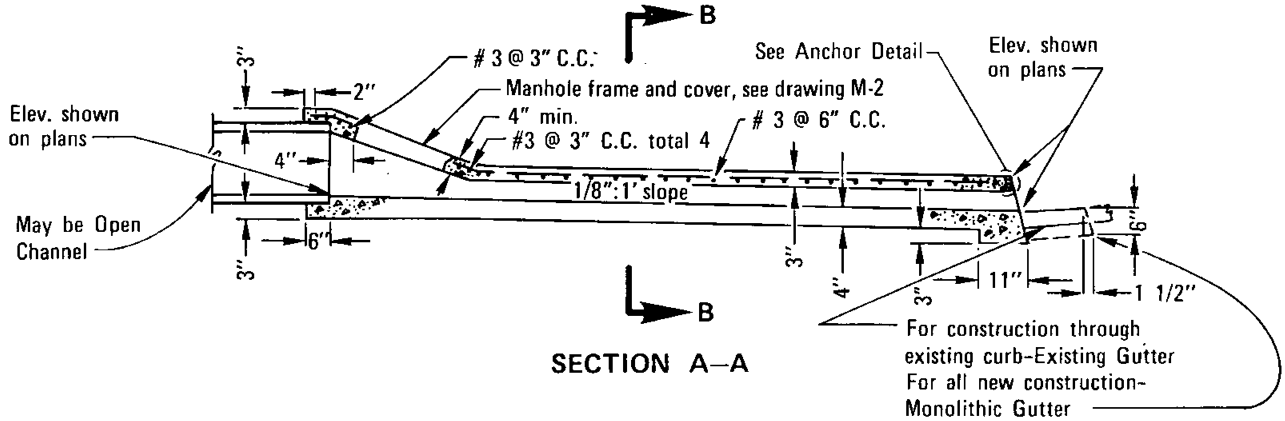
ENTRANCE TAPER AND DOWNDRAIN PIPE

DRAWING NUMBER **D-24**

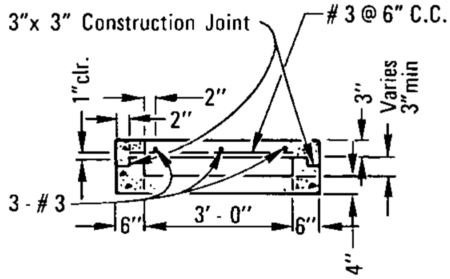
Revision	By	Approved	Date



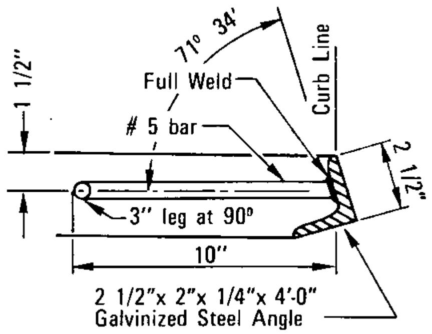
PLAN



SECTION A–A



SECTION B–B

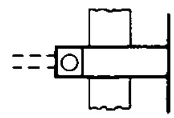


ANCHOR DETAIL

NOTES

1. Concrete shall be 564-C-3000.
2. D=inside diameter of pipe or depth of channel.
3. Section to be sloped laterally with top conforming to the grades of the existing sidewalk and curb.
4. Manhole frame and cover may be deleted with open channel.
5. Trowel finish top surface and reproduce markings of existing sidewalk and curb.
6. Trowel finish floor of outlet.

LEGEND ON PLANS



Revision	By	Approved	Date

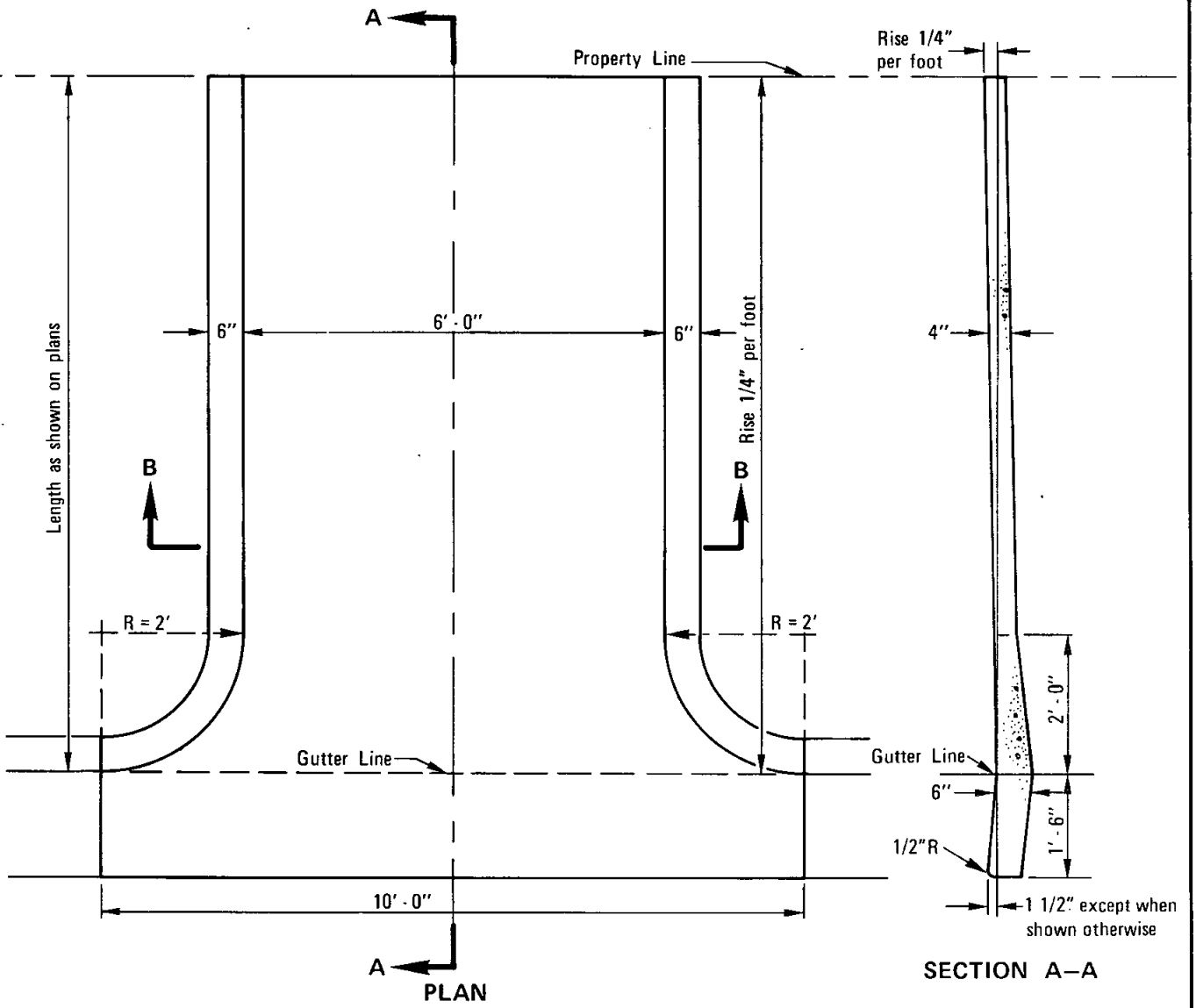
SAN DIEGO REGIONAL STANDARD DRAWING

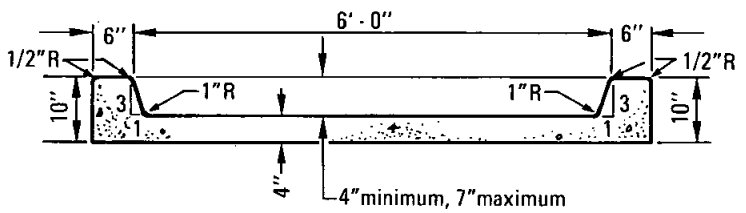
CURB OUTLET - TYPE A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

[signature] Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **D-25**



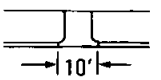


SECTION B–B

NOTES

1. Not to be used in sidewalk areas.
2. Concrete shall be 517-C-2500.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

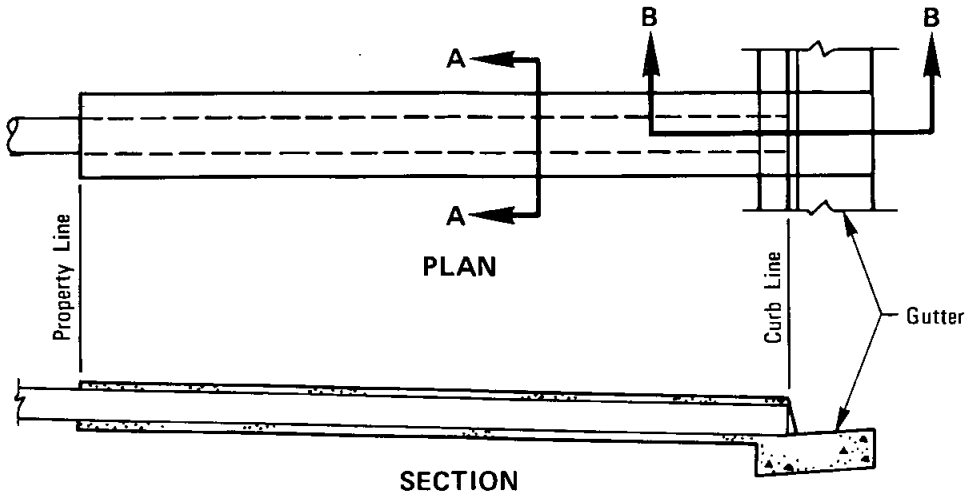
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER **D-26**

SAN DIEGO REGIONAL STANDARD DRAWING

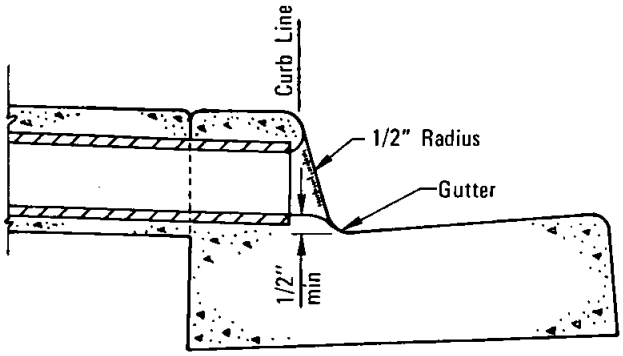
CURB OUTLET - TYPE B

Revision	By	Approved	Date

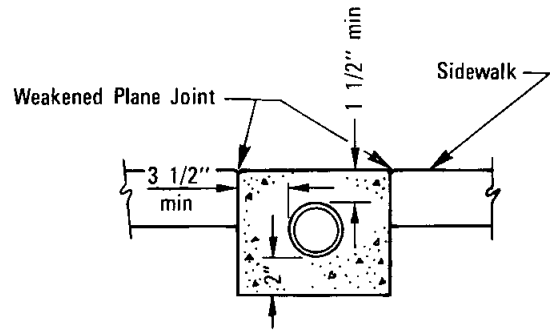


PLAN

SECTION

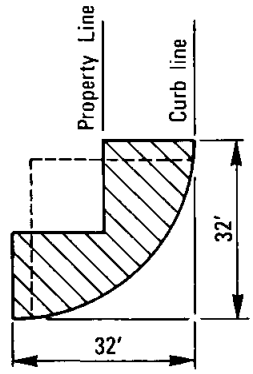


SECTION B–B



SECTION A–A

APPROVED DRAIN PIPE SIZES	
3"	6" to 8" CURB FACE
4"	8" CURB FACE
6"	10" CURB FACE



Drain shall not occupy the hatched area

BLOCK CORNER

NOTES

1. Pipe shall be one continuous length from property line to curb line.
2. Multiple pipes to be set a minimum distance of D/2 apart.
3. Concrete shall be 517-C-2500.
4. Pipe shall be circular asbestos cement, cast iron or rigid plastic.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

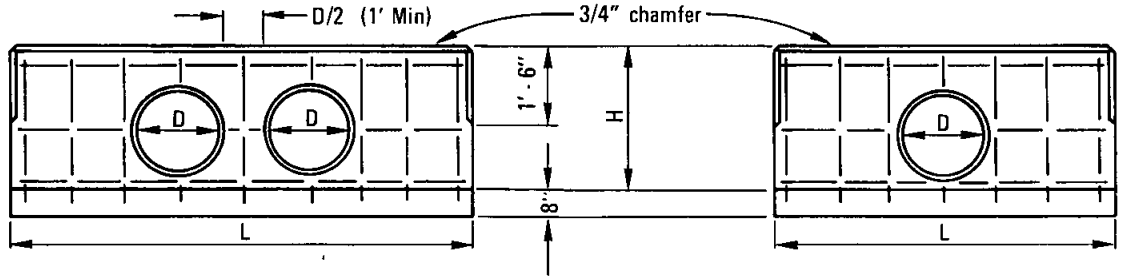
SIDEWALK UNDERDRAIN PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A. Kershaw — Dec. 1975

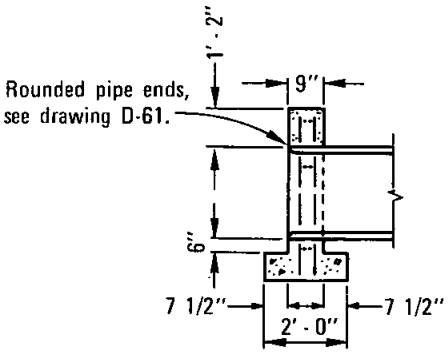
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **D-27**



ELEVATION DOUBLE HEADWALL

ELEVATION SINGLE HEADWALL



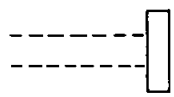
SECTION

D	H	SINGLE			DOUBLE		
		L	Steel Lbs.	Conc C. Y.	L	Steel Lbs.	Conc C. Y.
12"	2' - 8"	5' - 0"	35	0.60	8' - 0"	50	0.94
15"	2' - 11"	6' - 0"	40	0.75	9' - 6"	60	1.17
18"	3' - 2"	7' - 0"	50	0.91	10' - 6"	75	1.35
21"	3' - 5"	7' - 6"	60	1.02	11' - 6"	90	1.52
24"	3' - 8"	8' - 6"	75	1.20	12' - 6"	100	1.72
27"	3' - 11"	9' - 6"	85	1.39	14' - 0"	115	2.00
30"	4' - 2"	10' - 0"	85	1.52	15' - 0"	126	2.21
33"	4' - 5"	11' - 0"	100	1.73	16' - 0"	130	2.42
36"	4' - 8"	12' - 0"	105	1.95	17' - 0"	145	2.65
39"	4' - 11"	12' - 6"	130	2.09	18' - 0"	170	2.88
42"	5' - 2"	13' - 6"	140	2.34	19' - 0"	185	3.13
45"	5' - 5"	14' - 6"	150	2.60	20' - 0"	195	3.38
48"	5' - 8"	15' - 0"	160	2.75	21' - 0"	200	3.64
51"	5' - 11"	16' - 0"	180	3.03	22' - 6"	225	4.02
54"	6' - 2"	17' - 0"	190	3.31	23' - 6"	240	4.30

NOTES

1. Concrete shall be 564-C-3000.
2. All reinforcing steel # 4 bars. All vertical and horizontal tie bars 18" maximum spacing.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

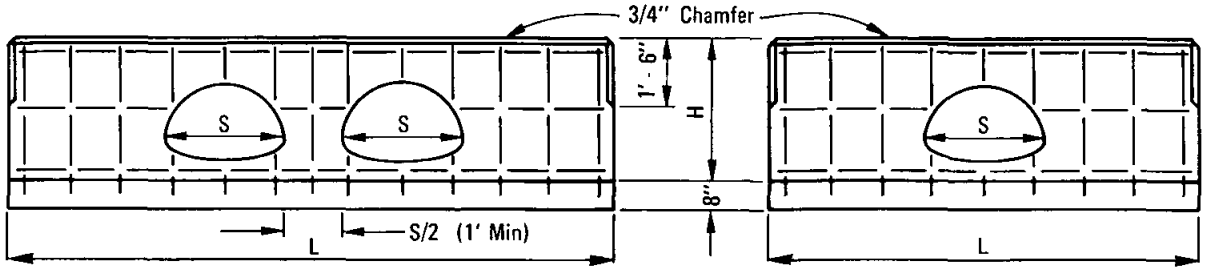
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

STRAIGHT HEADWALL - TYPE A (CIRCULAR PIPE)

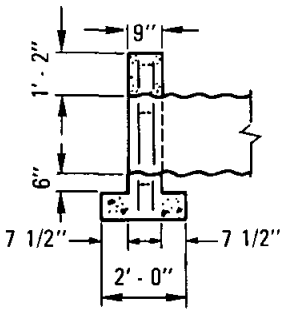
DRAWING NUMBER D-30

Revision	By	Approved	Date



ELEVATION DOUBLE HEADWALL

ELEVATION SINGLE HEADWALL



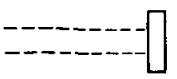
SECTION

C.S.P. ARCH SIZE	H	SINGLE			DOUBLE		
		L	Steel Lbs	Conc Cu. Yds.	L	Steel Lbs	Conc Cu. Yds.
18" x 11"	2' - 7"	5' - 6"	37	0.64	8' - 0"	52	.91
21" x 15"	2' - 11"	6' - 6"	45	0.80	10' - 0"	60	1.22
24" x 18"	3' - 2"	7' - 6"	50	0.96	11' - 6"	70	1.45
28" x 20"	3' - 4"	8' - 6"	60	1.12	13' - 6"	90	1.76
35" x 24"	3' - 8"	10' - 6"	85	1.47	15' - 6"	120	2.16
42" x 29"	4' - 1"	12' - 6"	110	1.76	18' - 0"	145	2.57
49" x 33"	4' - 5"	14' - 6"	130	2.26	21' - 0"	170	3.13
57" x 38"	4' - 10"	17' - 0"	155	2.81	24' - 6"	210	3.86
64" x 43"	5' - 3"	19' - 0"	175	3.31	27' - 0"	230	4.42
71" x 47"	5' - 7"	21' - 0"	195	3.81	30' - 0"	255	5.09

NOTES

1. Concrete shall be 564-C-3000.
2. All reinforcing steel # 4 bars. All vertical and horizontal tie bars 18" maximum spacing.

LEGEND ON PLANS



Revision	By	Approved	Date

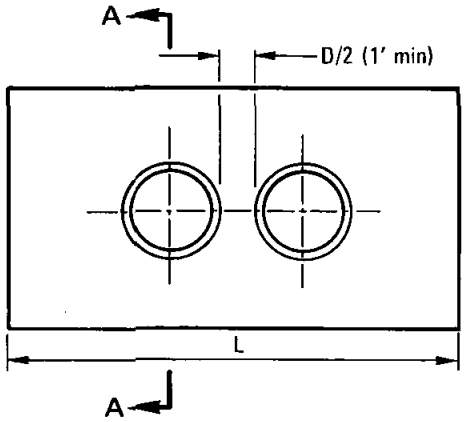
SAN DIEGO REGIONAL STANDARD DRAWING

STRAIGHT HEADWALL - TYPE A
(C.S.P.-ARCH)

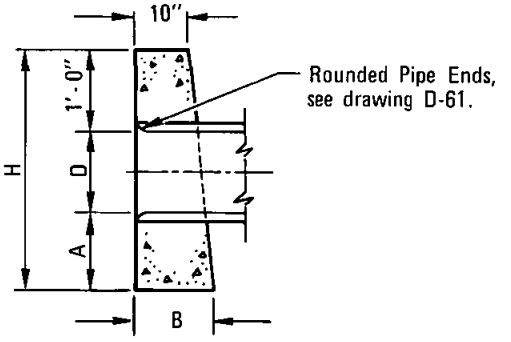
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

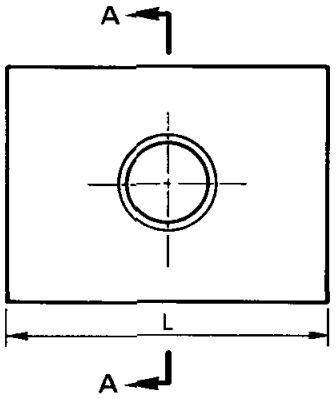
DRAWING NUMBER **D-31**



DOUBLE PIPE ELEVATION



SECTION A–A



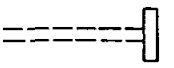
SINGLE PIPE ELEVATION

D	A	B	H	SINGLE		DOUBLE	
				L	Conc C.Y.	L	Conc C.Y.
12"	2'-0"	1'-0"	4'-0"	4'-0"	.45	5'-8"	.62
15"	2'-0"	1'-1"	4'-3"	5'-0"	.63	7'-1"	.85
18"	2'-0"	1'-2"	4'-6"	6'-0"	.83	8'-6"	1.12
24"	2'-6"	1'-5"	5'-6"	8'-0"	1.54	11'-4"	2.09
30"	2'-6"	1'-9"	6'-0"	10'-0"	2.41	14'-2"	3.26
36"	3'-0"	2'-0"	7'-0"	12'-0"	3.74	17'-0"	5.05

NOTES

1. Concrete shall be 564 - C - 3000.
2. Exposed corners to be chamfered 3/4".

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

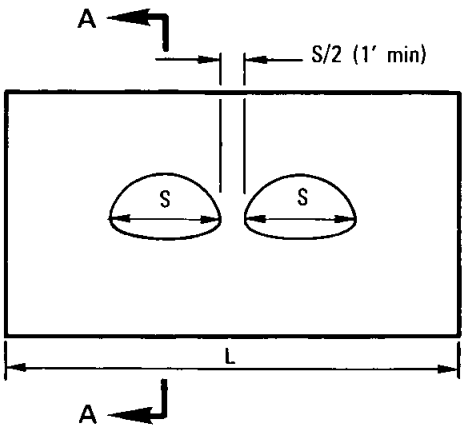
Allan A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

SAN DIEGO REGIONAL STANDARD DRAWING

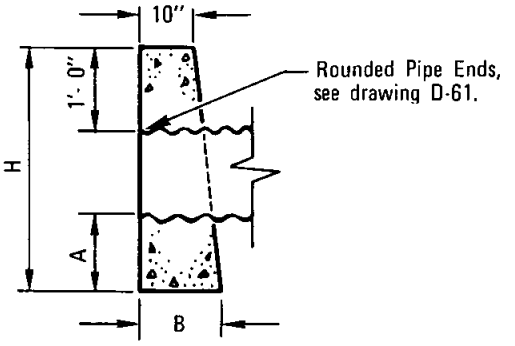
STRAIGHT HEADWALL - TYPE B (CIRCULAR PIPE)

DRAWING NUMBER D-32

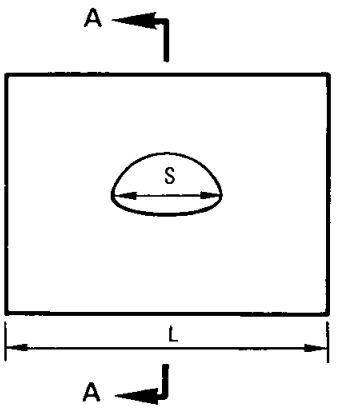
Revision	By	Approved	Date



DOUBLE PIPE
ELEVATION



SECTION A–A



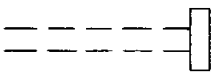
SINGLE PIPE
ELEVATION

C.S.P. ARCH SIZE	A	B	H	SINGLE		DOUBLE	
				L	Conc C.Y.	L	Conc C.Y.
18"x 11"	2' - 0"	1' - 2"	3' - 11"	6'	0.83	7' - 3"	0.97
21"x 15"	2' - 0"	1' - 4"	4' - 1"	7'	1.08	9' - 8"	1.46
24"x 18"	2' - 0"	1' - 6"	4' - 4"	8'	1.41	11' - 6"	1.98
28"x 20"	2' - 6"	1' - 8"	5' - 0"	9'	1.97	12' - 6"	2.66
35"x 24"	2' - 6"	2' - 0"	5' - 4"	10'	2.56	14' - 5"	3.60

NOTES

1. Concrete shall be 564 - C - 3000.
2. Exposed corners to be chamfered 3/4".

LEGEND ON PLANS



Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

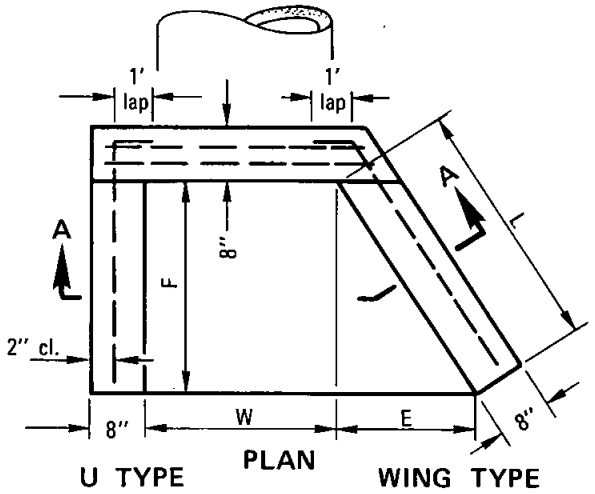
STRAIGHT HEADWALL - TYPE B
(C.S.P. ARCH)

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

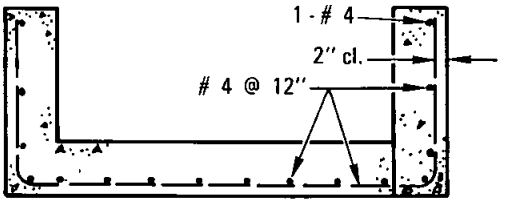
Albert A Kercheval — Coordinator R.C.E. 19807

Dec. 1975 — Date

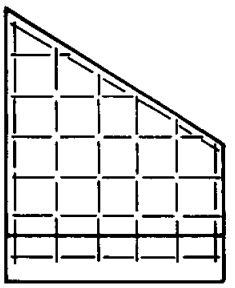
DRAWING NUMBER **D-33**



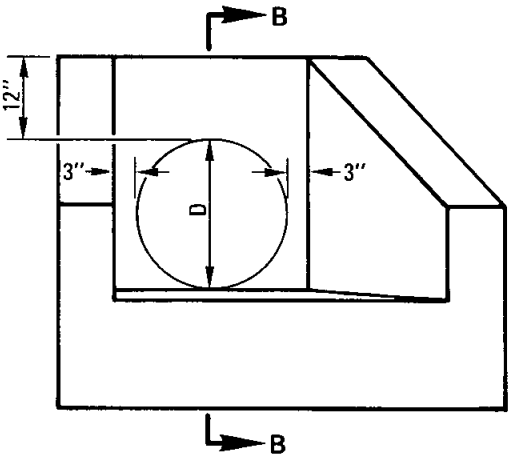
U TYPE PLAN WING TYPE



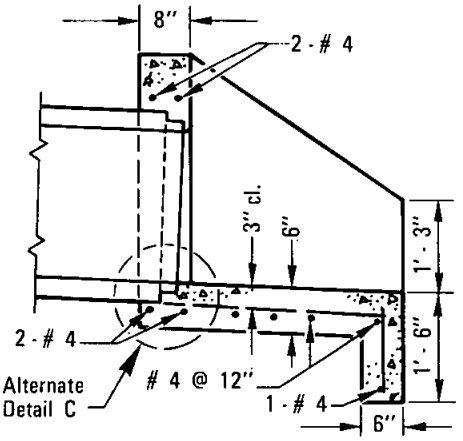
SECTION A–A



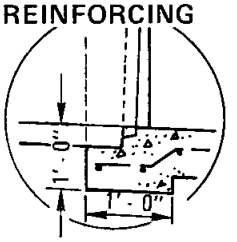
WING WALL REINFORCING



ELEVATION



SECTION B–B



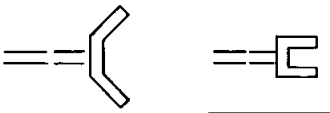
ALT. DETAIL C

DIA OF PIPE	DIMENSIONS			SINGLE PIPE					DOUBLE PIPE				
				W	U TYPE		WING TYPE		W	U TYPE		WING TYPE	
	L	E	F		CONC C. Y.	STEEL LBS.	CONC C. Y.	STEEL LBS.		CONC C. Y.	STEEL LBS.	CONC C. Y.	STEEL LBS.
18"	2'-3 1/8"	1'-3"	1'-10 1/2"	2'-0"	0.55	35	0.63	43	As shown on plans	0.82	53	0.90	61
24"	3'-1 7/8"	1'-9"	2'-7 1/2"	2'-6"	0.79	47	0.93	60		1.22	73	1.36	86
30"	4'-0 5/8"	2'-3"	3'-4 1/2"	3'-0"	1.05	71	1.29	85		1.66	109	1.92	123
36"	4'-11 1/2"	2'-9"	4'-1 1/2"	3'-6"	1.33	88	1.69	114		2.19	136	2.55	162

NOTES:

1. Concrete shall be 564 - C - 3000.
2. Exposed corners to be chamfered 3/4".
3. Multiple pipes to be set a distance of D/2, with a 1' minimum between outside diameters of pipes.
4. Top of headwall shall be placed approximately parallel to profile grade when the grade is 3% or more.
5. Skewed pipes: Dimension W to be increased in width or length due to skew or multiple pipes.
6. For pipe wall thickness greater than 3" use alternate Detail–C.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

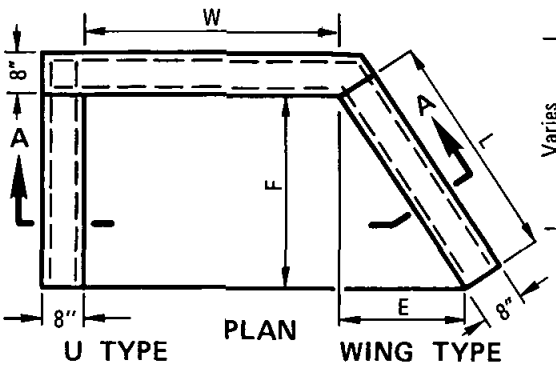
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

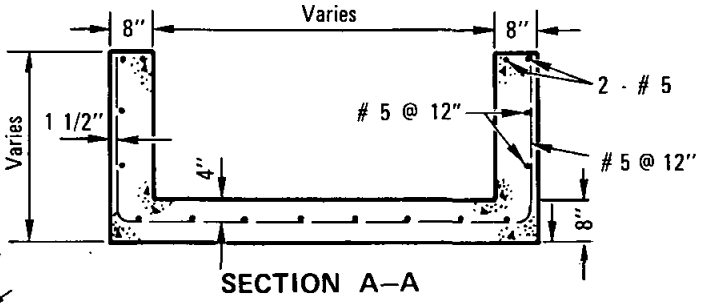
WING AND U TYPE HEADWALLS FOR 12" TO 36" PIPES

DRAWING NUMBER D-34

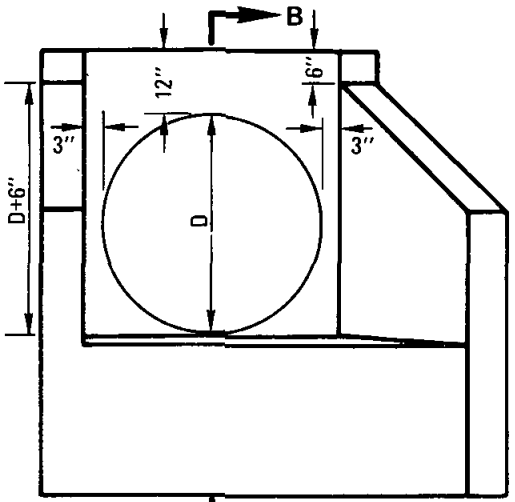
Revision	By	Approved	Date



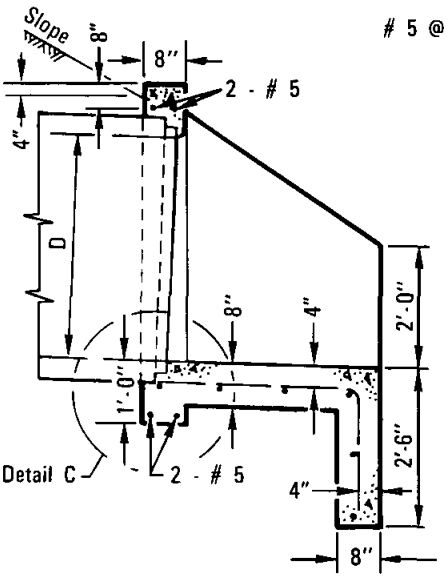
U TYPE PLAN WING TYPE



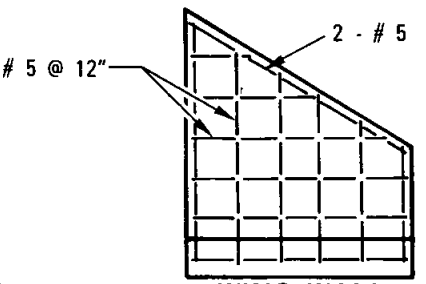
SECTION A–A



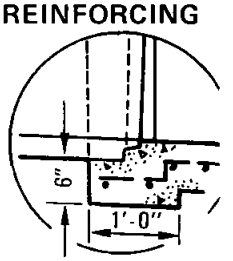
ELEVATION



SECTION B–B



WING WALL REINFORCING



ALT. DETAIL C

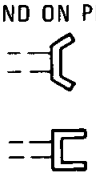
DIA. OF PIPE	DIMENSIONS			SINGLE PIPE					DOUBLE PIPE				
					U TYPE		WING TYPE			U TYPE		WING TYPE	
	L	E	F	W	CONC. C.Y.	STEEL LBS.	CONC. C.Y.	STEEL LBS.	W	CONC. C.Y.	STEEL LBS.	CONC. C.Y.	STEEL LBS.
42"	3'-7 1/4"	2'-0"	3'-0"	4'-0"	1.57	117	1.90	135	AS SHOWN ON PLANS	2.69	190	3.16	214
48"	4'-6"	2'-6"	3'-9"	4'-6"	1.97	153	2.48	184		3.43	252	4.06	288
54"	5'-4 7/8"	3'-0"	4'-6"	5'-0"	2.41	190	3.07	246		4.24	319	5.06	368
60"	6'-3 3/4"	3'-6"	5'-3"	5'-6"	2.88	239	3.75	294		5.13	386	6.17	442
66"	7'-2 1/2"	4'-0"	6'-0"	6'-0"	3.38	294	4.52	356		6.08	454	7.20	516
72"	8'-1 3/8"	4'-6"	6'-9"	6'-6"	3.93	368	5.52	417		7.11	522	8.30	588
78"	9'-0"	5'-0"	7'-6"	7'-0"	4.50	444	6.70	503		8.20	595	9.50	693
84"	9'-10 3/4"	5'-6"	8'-3"	7'-6"	5.21	540	8.15	619		9.50	687	10.80	786

Note: Dimensions E and L apply to wing type only.

NOTES

1. Skewed Pipes: Dimension W to be increased to take care of increased width or length due to skew of multiple pipes.
2. Tops of headwalls, on grade culverts, shall be placed parallel to profile grade when the grades are 3% or more.
3. Concrete shall be 564-C-3000.
4. Exposed corners shall be chamfered 3/4".
5. Multiple pipes shall be set a distance of D/2, with a 1' minimum, between outside diameters of pipes.
6. For pipe wall thickness greater than 3" use Alternate Detail-C.

LEGEND ON PLANS



Revision	By	Approved	Date

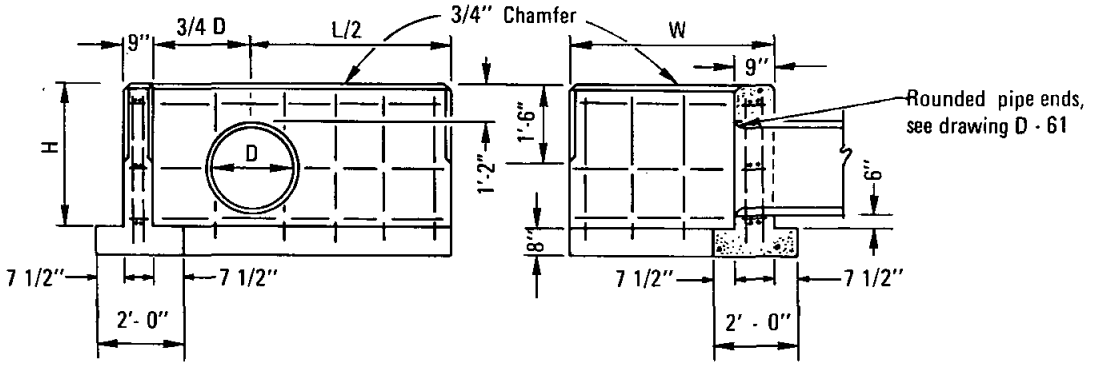
SAN DIEGO REGIONAL STANDARD DRAWING

WING AND U TYPE HEADWALLS FOR 42" TO 84" PIPES

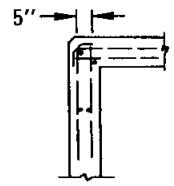
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER **D-35**



ELEVATION SECTION



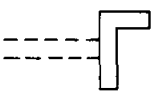
CORNER STEEL DETAIL

D	H	L/2	LENGTH OF W									
			3' - 4"		4' - 10"		6' - 4"		7' - 10"		9' - 4"	
			Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.
12"	2' - 8"	2' - 6"	50	.79	60	.98						
15"	2' - 11"	3' - 0"	55	.91	65	1.11						
18"	3' - 2"	3' - 6"	65	1.04	75	1.25						
21"	3' - 5"	3' - 9"	75	1.15	90	1.36						
24"	3' - 8"	4' - 3"	85	1.29	100	1.51	110	1.74				
27"	3' - 11"	4' - 9"	90	1.44	105	1.67	115	1.91				
30"	4' - 2"	5' - 0"	95	1.55	110	1.80	120	2.05	135	2.29		
33"	4' - 5"	5' - 6"	105	1.71	120	1.97	135	2.23	150	2.48		
36"	4' - 8"	6' - 0"	110	1.88	125	2.15	140	2.41	155	2.68	170	2.95
39"	4' - 11"	6' - 3"			150	2.28	170	2.56	185	2.84	200	3.12
42"	5' - 2"	6' - 9"			155	2.42	175	2.76	190	3.05	210	3.34
45"	5' - 5"	7' - 3"					180	2.97	200	3.27	215	3.57
48"	5' - 8"	7' - 6"					190	3.13	216	3.44	230	3.75
51"	5' - 11"	8' - 0"							220	3.67	235	3.99
54"	6' - 2"	8' - 6"							235	3.91	250	4.24

NOTES

1. Concrete shall be 564 - C - 3000.
2. All reinforcing steel # 4 bars. All vertical and horizontal tie bars 18" maximum spacing.
3. When multiple pipes are used, the distance between pipes shall be D/2 (1' min.). Dimension L/2 is from the center of the pipe nearest to the end of the headwall as shown.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

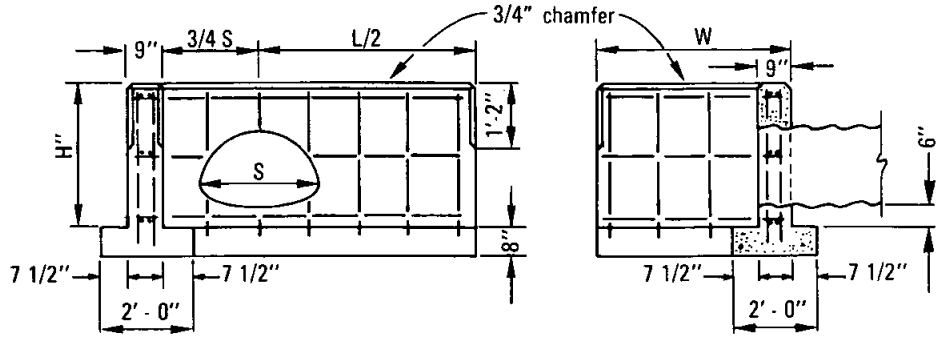
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

L TYPE HEADWALLS CIRCULAR PIPES

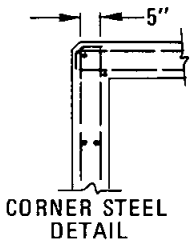
DRAWING NUMBER D-36

Revision	By	Approved	Date



ELEVATION

SECTION



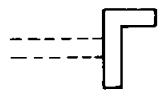
CORNER STEEL DETAIL

C.S.P. ARCH SIZE	H	L/2	LENGTH OF W									
			3' - 4"		4' - 10"		6' - 4"		7' - 10"		9' - 4"	
			Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.	Steel lbs.	Conc C. Y.
18"x 11"	2'-7"	2'-9"	50	0.84	60	1.03	70	1.21	80	1.39	90	1.57
21"x 15"	2'-11"	3'-3"	60	1.00	65	1.18	75	1.38	90	1.58	100	1.77
24"x 18"	3'-2"	3'-9"	60	1.07	70	1.32	80	1.53	95	1.74	110	1.94
28"x 20"	3'-4"	4'-3"	70	1.26	80	1.47	90	1.68	100	1.90	115	2.11
35"x 24"	3'-8"	5'-3"	100	1.51	110	1.74	120	1.97	140	2.20	155	2.42
42"x 29"	4'-1"	6'-3"	115	1.82	130	2.06	140	2.31	155	2.55	170	2.83
49"x 33"	4'-5"	7'-3"	130	2.12	145	2.37	155	2.64	170	2.90	185	3.15
57"x 38"	4'-10"	8'-6"	145	2.52	160	2.79	175	3.07	190	3.35	205	3.61
64"x 43"	5'-3"	9'-6"	185	2.89	200	3.11	215	3.48	235	3.77	250	4.06
71"x 47"	5'-7"	10'-6"	200	3.25	215	3.56	235	3.86	250	4.17	270	4.48

NOTES

1. Concrete shall be 564 - C - 3000.
2. All reinforcing steel # 4 bars. All vertical and horizontal tie bars 18" maximum spacing.
3. When multiple pipes are used, the distance between pipes shall be S/2 (1' min.). The dimension L/2 is from the center of the pipe nearest to the end of the headwall as shown.

LEGEND ON PLANS



Revision	By	Approved	Date

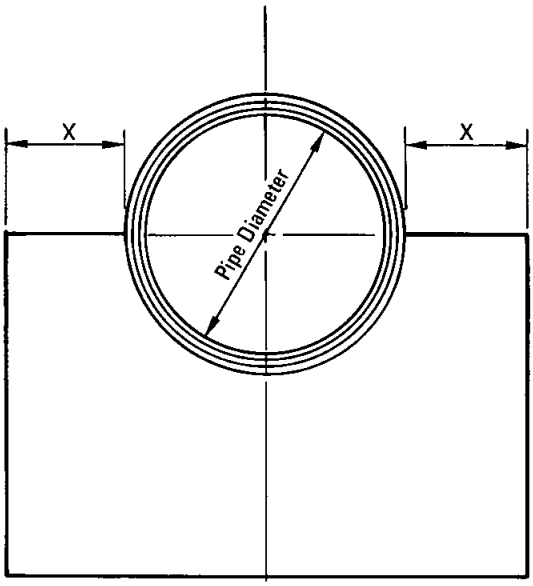
SAN DIEGO REGIONAL STANDARD DRAWING

L TYPE HEADWALLS
(C.S.P. ARCH)

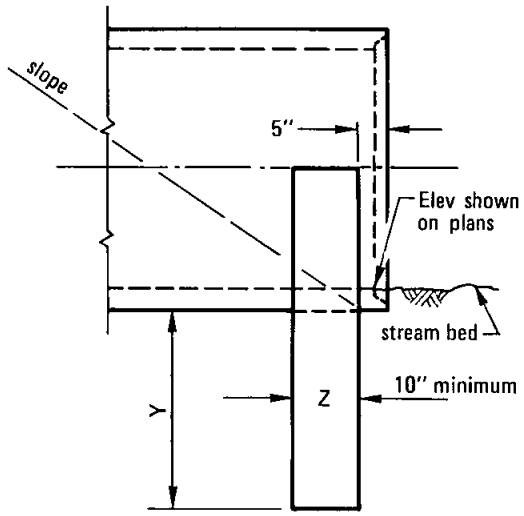
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan G. Kenkel — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **D-37**



FACE ELEVATION



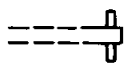
SIDE ELEVATION

PIPE DIAMETER	X	Y	Z
12" to 24"	1' - 0"	2' - 0"	10"
21" to 36"	1' - 6"	2' - 6"	12"
39" to 48"	2' - 0"	3' - 0"	12"
51" to 60"	2' - 6"	3' - 0"	14"
63" & Larger	3' - 0"	3' - 0"	14"

NOTES:

1. A curtain wall shall be used in place of a headwall at culvert ends where extension of the culvert is considered imminent or no fill is retained.
2. Concrete shall be 564-C-3000.
3. Keep the pipe-end clear of obstructions to permit easy placing of culvert extension.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A Kercheval Dec. 1975

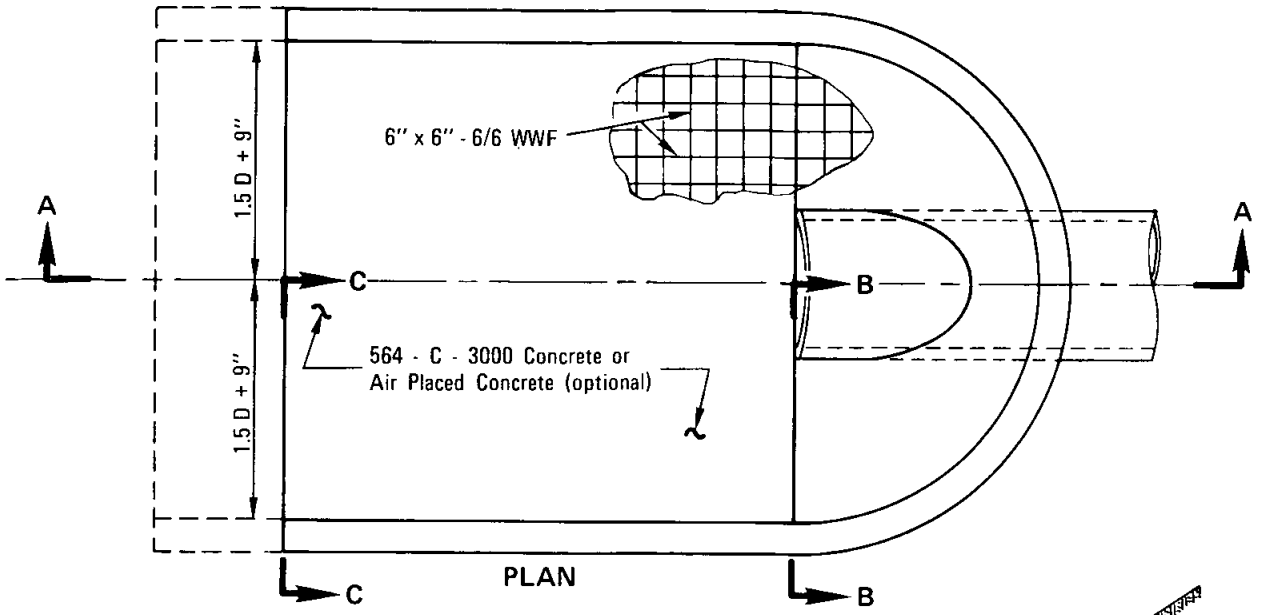
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

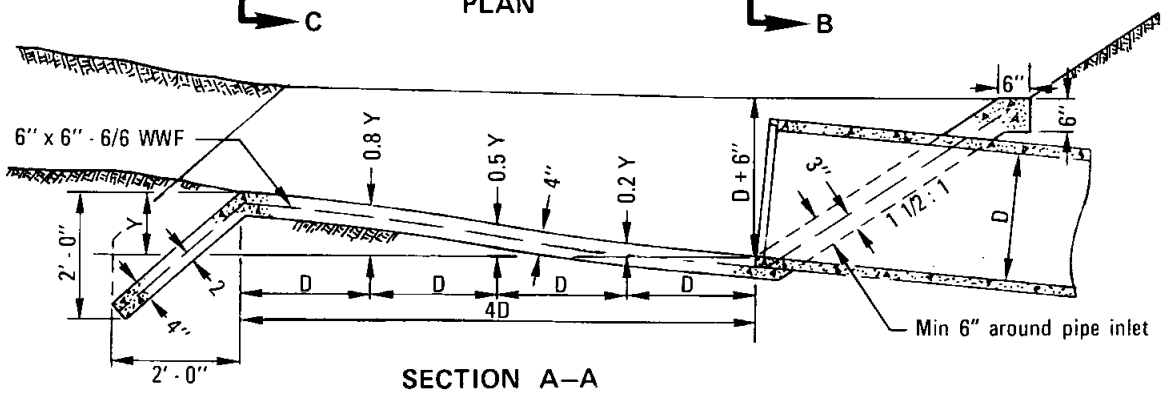
CURTAIN WALL

DRAWING NUMBER D-38

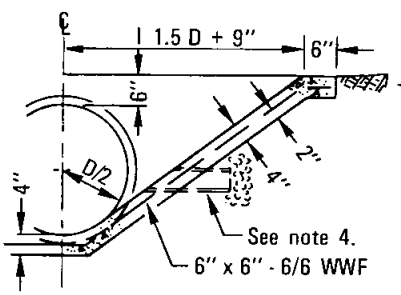
Revision	By	Approved	Date



PLAN

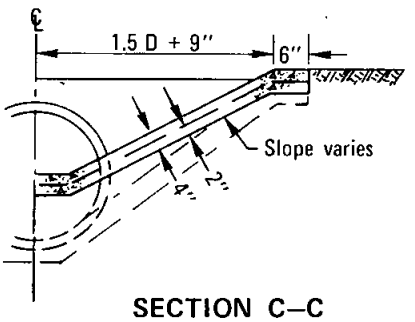


SECTION A–A



SECTION B–B

Inlet constr. sym. about ℄ except for multiple pipe installations (see note 1)

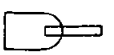


SECTION C–C

NOTES

1. When more than one pipe is used the profile view shown shall hold for the distance across all pipe openings. Sections A-A and B-B shall be from the outermost pipe. The distance between pipes shall be D/2 for round and Span/3 for arch pipe. (12" minimum)
2. Culvert shall be cut off even with apron surface when required by the Agency.
3. Use Inlet Apron only where a flared end section can not be utilized.
4. Place weep holes when required by the Agency.

LEGEND ON PLANS



Revision	By	Approved	Date

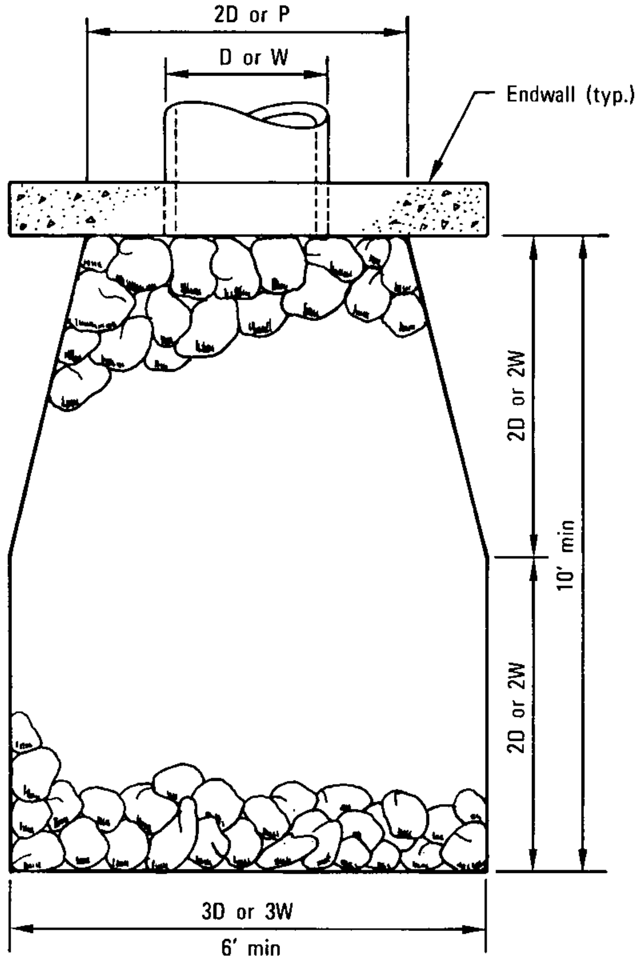
SAN DIEGO REGIONAL STANDARD DRAWING

INLET APRON FOR CULVERTS UP TO 42" DIAMETER

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kershaw — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **D-39**



PLAN

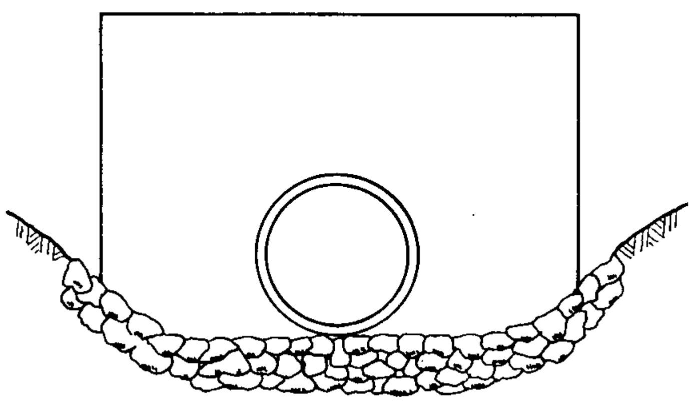
D = Pipe Diameter

W = Bottom Width of Channel

P = Wetted Perimeter of Channel

Design Velocity (ft./sec.)	Rock Classification
6 - 10	No. 2 Backing
10 - 12	1/4 Ton
12 - 14	1/2 Ton
14 - 16	1 Ton
16 - 18	2 Ton

SELECTION OF RIP RAP



ELEVATION

NOTES

1. Type of Rip Rap
   a. Regular Quarry Stone
   b. Rounded Cobblestone
   c. Broken Concrete (only allowed upon approval of the Agency)

2. Placement
   a. Minimum depth = 1 1/2 times average stone size.
   b. Rocks shall be placed so as to provide a minimum of voids.
   c. Surface rocks or concrete shall protrude to at least 1/2 their vertical dimension.
   d. Rip Rap is to be placed over a natural bedding, or it may be grouted or placed over a gravel bedding when required by the Agency.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

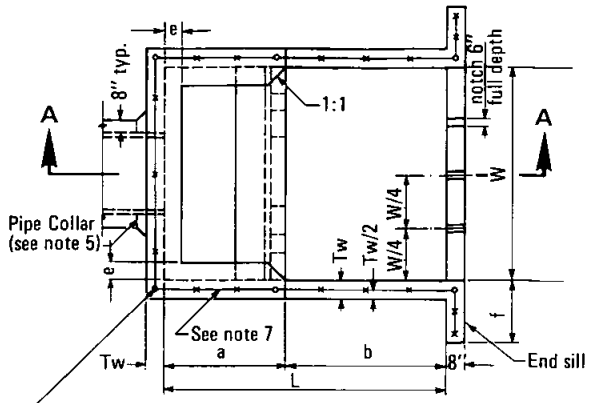
Allan A. Kerchner Dec. 1975
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

RIP RAP ENERGY DISSIPATOR

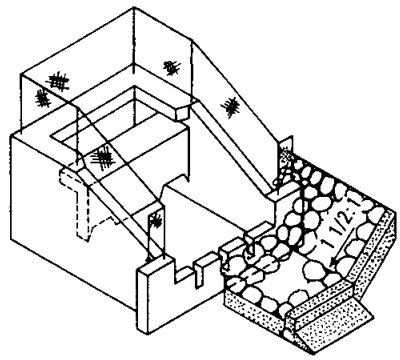
Revision	By	Approved	Date

DRAWING NUMBER **D-40**

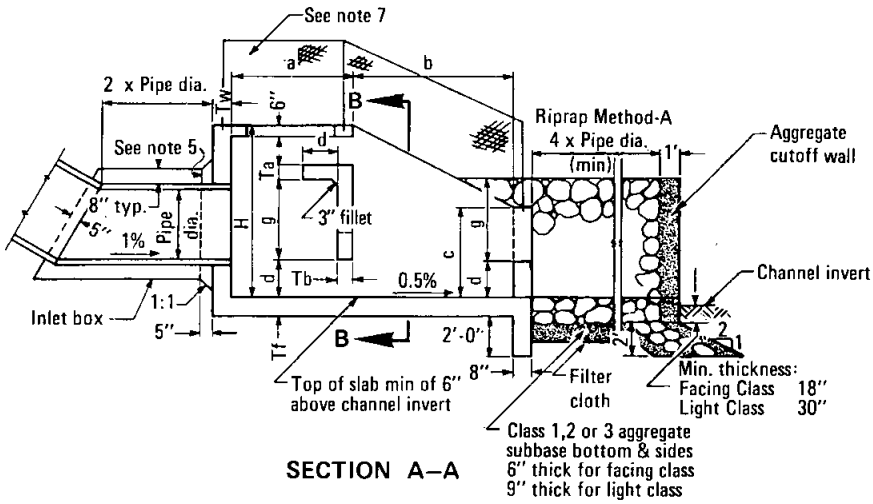


PLAN

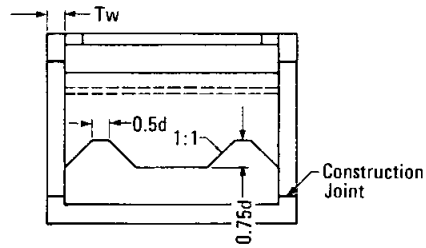
Note: Riprap not shown.



PICTORIAL VIEW



SECTION A–A



SECTION B–B

NOTES

1. Design:
   Equivalent Fluid Pressure = 60 p.c.f.
   Maximum Outlet Velocity = 35 f.p.s.
2. Concrete shall be 564 - C - 3000.
3. Reinforcing shall conform to ASTM designation A615 and may be grade 40 or 60. Reinforcing shall be placed with 2" clear concrete cover unless noted otherwise. Splices shall not be permitted except as indicated on the plans.
4. For pipe grades not exceeding 20%, inlet box may be omitted.
5. If inlet box is omitted, construct pipe collar as shown.
6. Unless noted otherwise, all reinforcing bar bends shall be fabricated with standard hooks.
7. Five foot high chain link fencing, embed post 18" deep in walls and encase with Class B mortar.
8. In Sandy and Silty soil:
   a) Riprap and aggregate base cutoff wall required at the end of rock apron.
   b) Filter cloth (Polyfilter X or equivalent) shall be installed on native soil and base, minimum of 1 ft. overlaps at joints.

Pipe Dia (in)	18	24	30	36	42	48	54	60	72
Area (sq.ft.)	1.77	3.14	4.91	7.07	9.62	12.57	15.90	19.63	28.27
Max. Q (cfs)	21	38	59	85	115	151	191	236	339
W	5' - 6"	6' - 9"	8' - 0"	9' - 3"	10' - 6"	11' - 9"	13' - 0"	14' - 3"	16' - 6"
H	4' - 3"	5' - 3"	6' - 3"	7' - 3"	8' - 0"	9' - 0"	9' - 9"	10' - 9"	12' - 3"
L	7' - 4"	9' - 0"	10' - 8"	12' - 4"	14' - 0"	15' - 8"	17' - 4"	19' - 0"	22' - 0"
a	3' - 3"	3' - 11"	4' - 7"	5' - 3"	6' - 0"	6' - 9"	7' - 4"	8' - 0"	9' - 3"
b	4' - 1"	5' - 1"	6' - 1"	7' - 1"	8' - 0"	8' - 11"	10' - 0"	11' - 0"	12' - 9"
c	2' - 4"	2' - 10"	3' - 4"	3' - 10"	4' - 5"	4' - 11"	5' - 5"	5' - 11"	6' - 11"
d	0' - 11"	1' - 2"	1' - 4"	1' - 7"	1' - 9"	2' - 0"	2' - 2"	2' - 5"	2' - 9"
e	0' - 6"	0' - 6"	0' - 8"	0' - 8"	0' - 10"	0' - 10"	1' - 0"	1' - 0"	1' - 3"
f	1' - 6"	2' - 0"	2' - 6"	3' - 0"	3' - 0"	3' - 0"	3' - 0"	3' - 0"	3' - 0"
g	2' - 1"	2' - 6"	3' - 0"	3' - 6"	3' - 11"	4' - 5"	4' - 11"	5' - 4"	6' - 2"
Tf	8"			10"		12"			
Tb	7"			9 1/2"		10 1/2"			
Tw	7"			9 1/2"		10 1/2"			
Ta	7"			8"					

Revision	By	Approved	Date

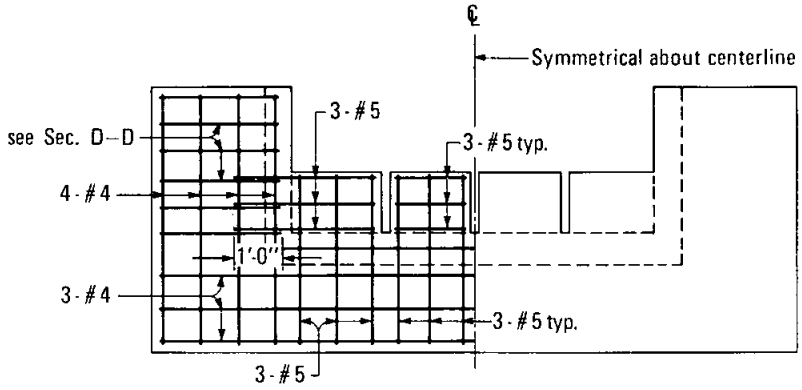
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE ENERGY DISSIPATOR

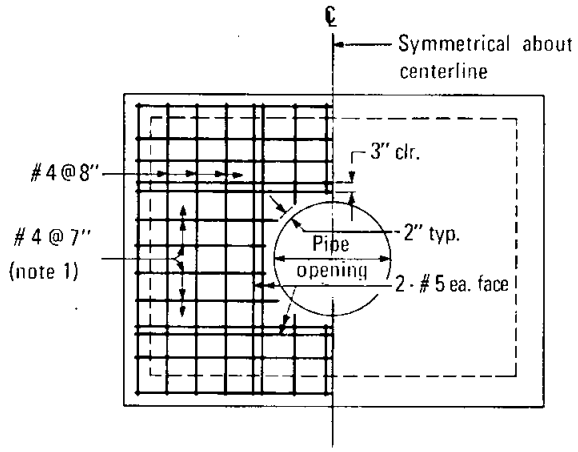
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

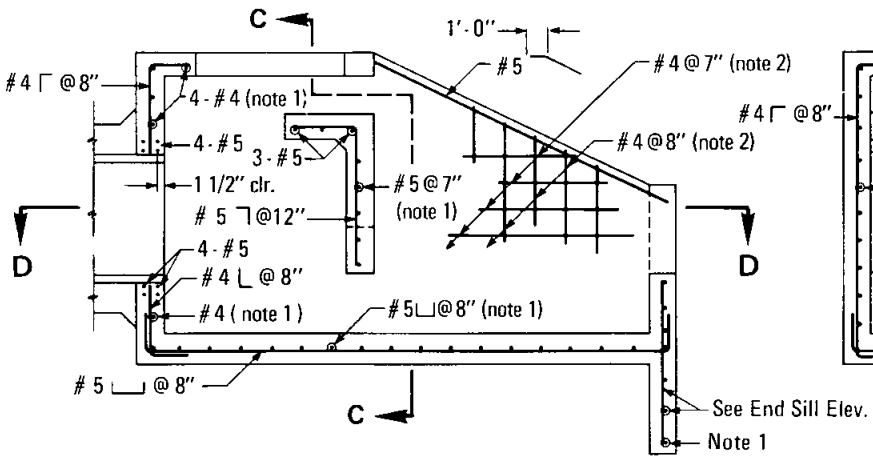
DRAWING NUMBER **D-41**



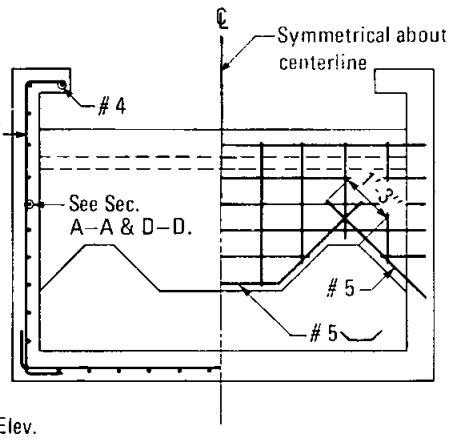
END SILL ELEVATION



HEADWALL ELEVATION



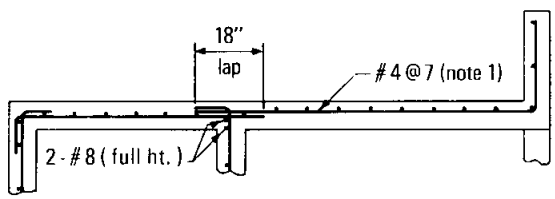
SECTION A–A



SECTION C–C

NOTES

1. Place reinforcing, as noted, at center wall (or slab).
2. Match location of reinforcing with that in headwall, end sill and foundation slab.
3. All reinforcing shall be placed with 2" concrete cover, unless noted otherwise.



SECTION D–D

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

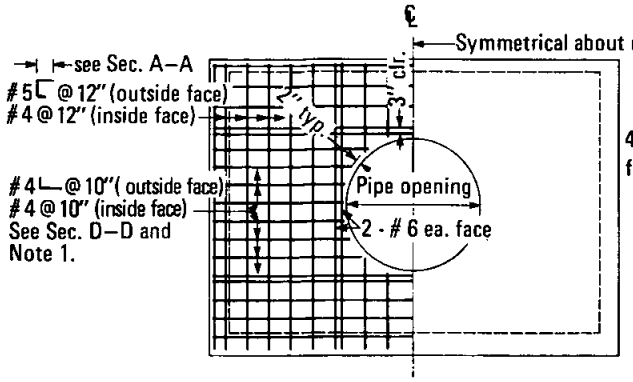
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER **D-42**

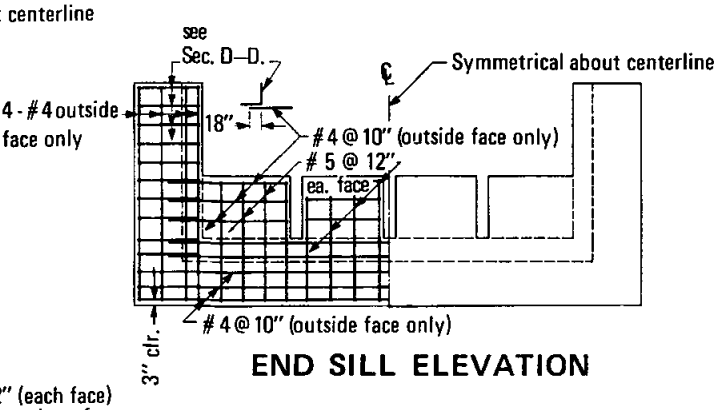
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE ENERGY DISSIPATOR (REINFORCEMENT) 18" TO 30" DIAMETER PIPE

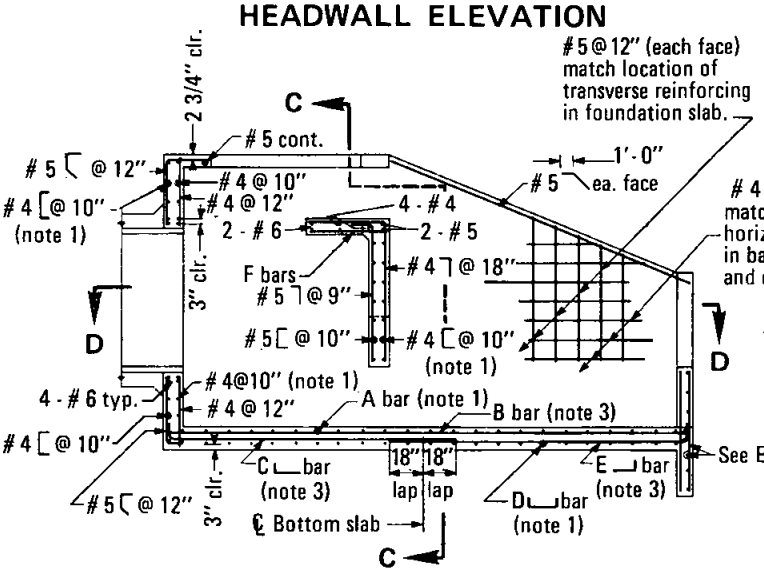
Revision	By	Approved	Date



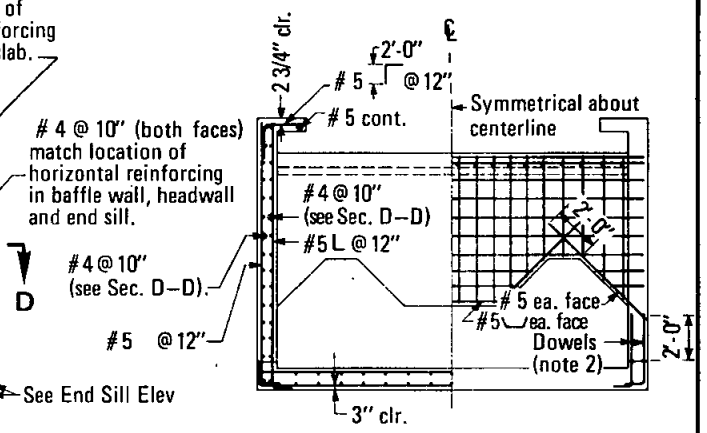
HEADWALL ELEVATION



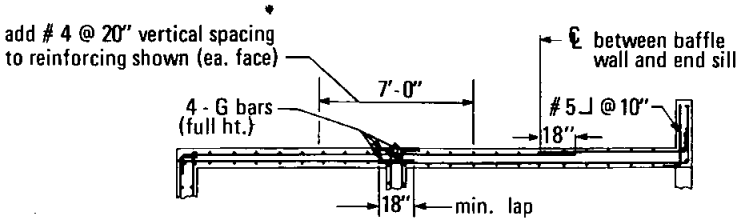
END SILL ELEVATION



SECTION A–A



SECTION C–C



SECTION D–D

NOTES

1. Match location of sidewall reinforcing.
2. Dowels having same size and spacing as wall reinforcing may be used in lieu of continuous bars at contractors option.
3. Match location of headwall or end sill reinforcing.

Pipe dia. (in.)	36	42	48	54	60	72
A bar	# 5 @ 12"		# 6 @ 12"		# 7 @ 12"	
B bar	# 5 @ 12"		# 6 @ 12"			
C bar	# 4 @ 12"		# 5 @ 12"			
D bar	# 4 @ 12"		# 5 @ 12"		# 6 @ 12"	
E bar	# 4 @ 12"		# 5 @ 12"			
F bar	# 4 @ 9"		# 5 @ 9"			#6@9"
G bar	# 7			# 11		

Revision	By	Approved	Date

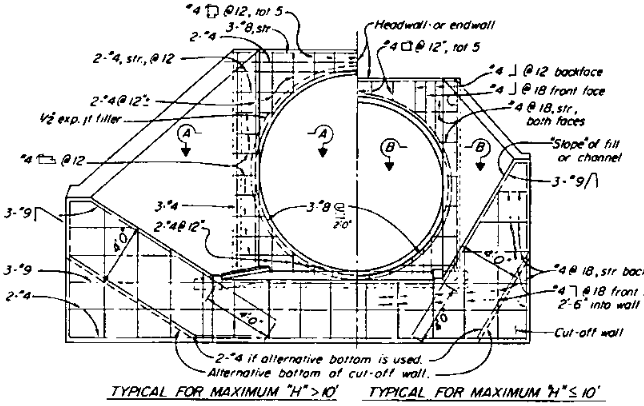
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE ENERGY DISSIPATOR (REINFORCEMENT) 36" TO 72" DIAMETER PIPE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

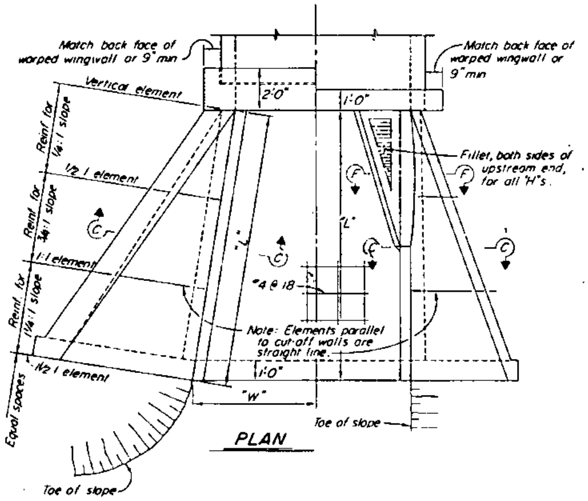
Allen A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **D-43**

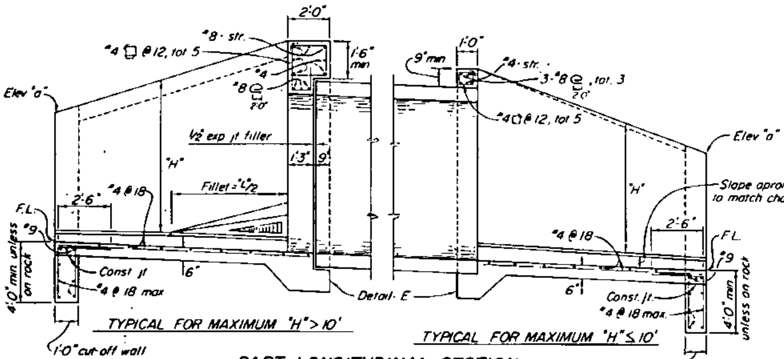


END ELEVATION

If at upstream end, fillet is not shown

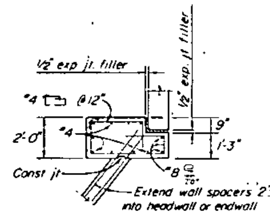


PLAN

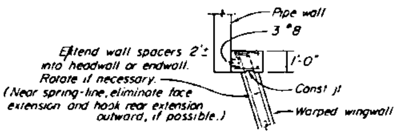


PART LONGITUDINAL SECTION

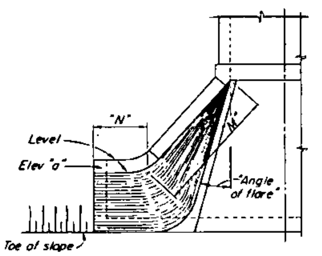
Note: RCP shown. Metal pipe similar except eliminate the expansion joint and use hook bolts @ 19"± spacing. Size and length provided by manufacturer.



SECTION A-A

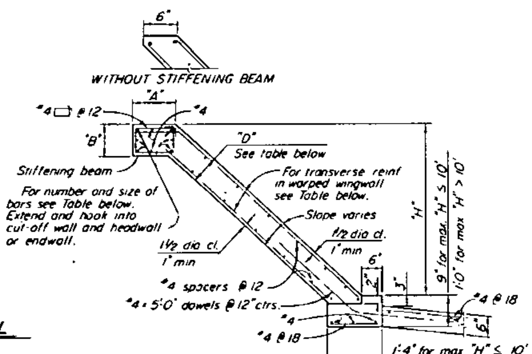


SECTION B-B



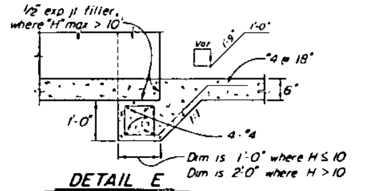
ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required. If at upstream end, fillet is not shown

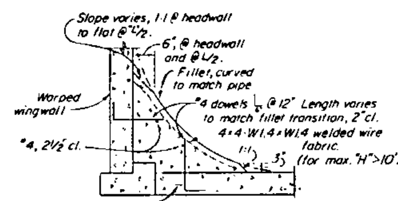


SECTION C-C

Where abrasion is anticipated, increase apron thickness to 7" min to provide 2" min. reinforcement coverage



DETAIL E



SECTION F-F

WARPED WINGWALLS								
WALL DIMENSIONS AND REINFORCING								
Element Slope	"H"	8' or less	10'	12'	14'	16'	18'	20'
¼:1	Front face reinf.	#4 @ 12	#4 @ 7	#5 @ 7	#5 @ 5	#6 @ 6	#7 @ 7	#7 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
¾:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 8	#4 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8
1¼:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6
"D" at Cut-off Wall		6"	6"	6"	7½"	8"	9½"	11"
"D" at Headwall/Endwall		6"	6"	6"	8"	9½"	11"	1'-1"

STIFFENING BEAM DIMENSIONS AND REINFORCING									
"H" max \ "L"	12'	14'	16'	18'	20'	25'	30'	35'	40' or more
6'	No beam Place 2-#6 in each								
8'	face along top of								
10'	wall		"A"= 1'-0"						
12'			"B"= 9"			"A"= 1'-6"			
14'		Tot 6-#6				"B"= 1'-0"		A = 1'-10"	
16'				Tot 6-#7			"B"= 1'-0"		"A"= 2'-0"
18'						Tot 6-#8			"B"= 1'-6"
20'							Tot 8-#9		

Notes: Walls designed for 2' surcharge; earth load = 120#/cu ft; equivalent fluid pressure = 36#/cu ft
Vary "D" at warped wall uniformly from that at cut-off wall to that at headwall or endwall, for max "H" > 12'
Dimensions "L", "W", "H", "M", "N", Elev "a", "Angle of flare", and end "Slope" (as apply) are shown on the plans.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kershner (signature) Dec. 1975

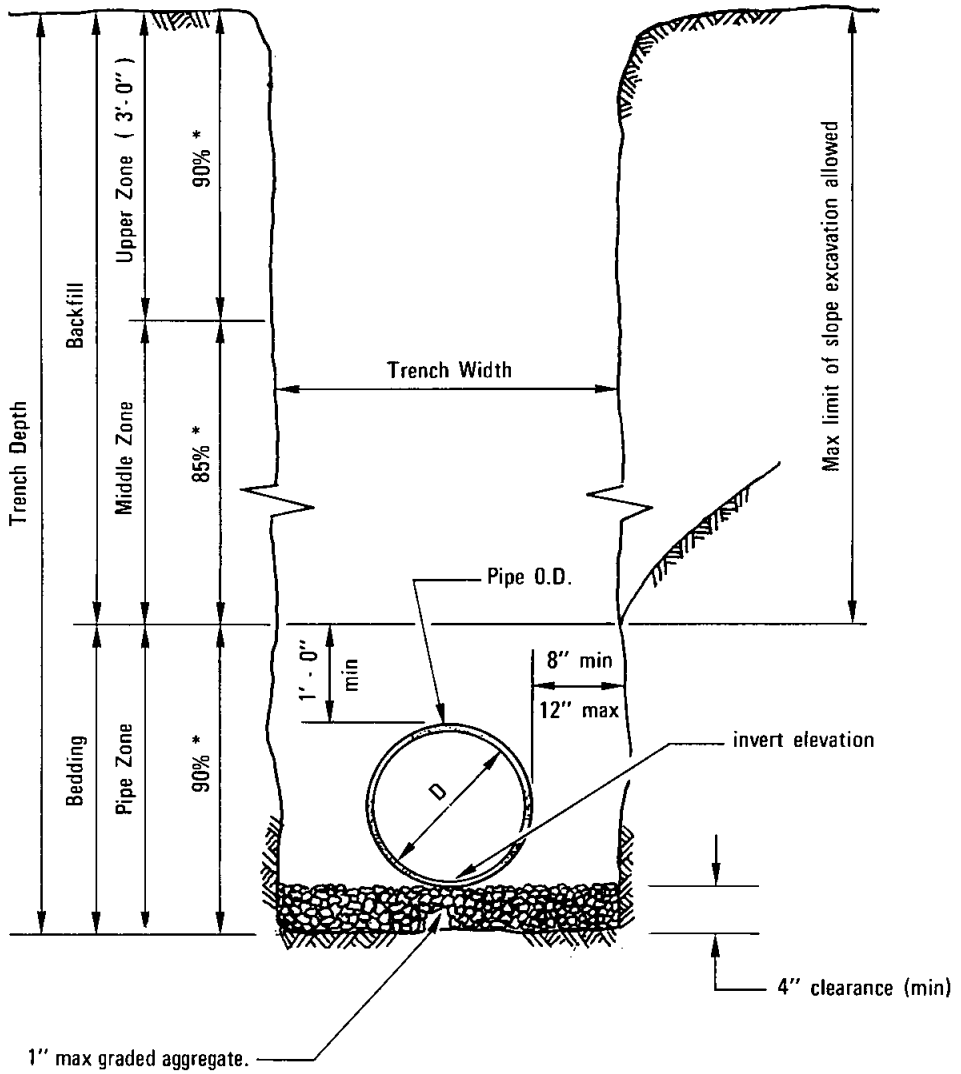
Coordinator R.C.E. 19807 Date

DRAWING NUMBER D-44

SAN DIEGO REGIONAL STANDARD DRAWING

PIPE CULVERT-HEADWALLS, ENDWALLS & WARPED WINGWALLS

Revision	By	Approved	Date

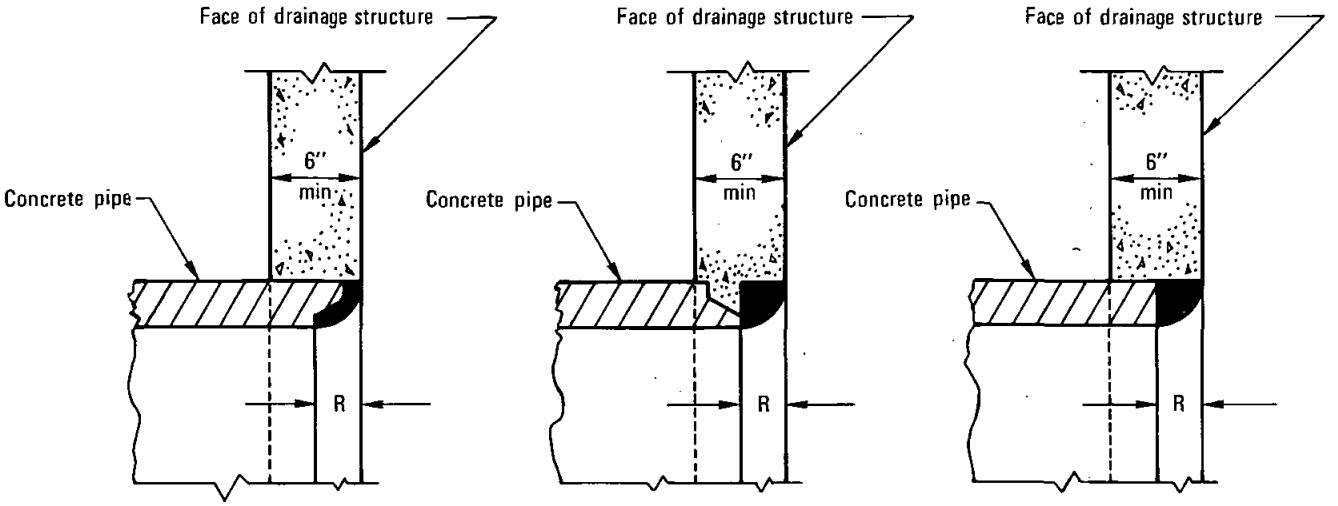


SECTION

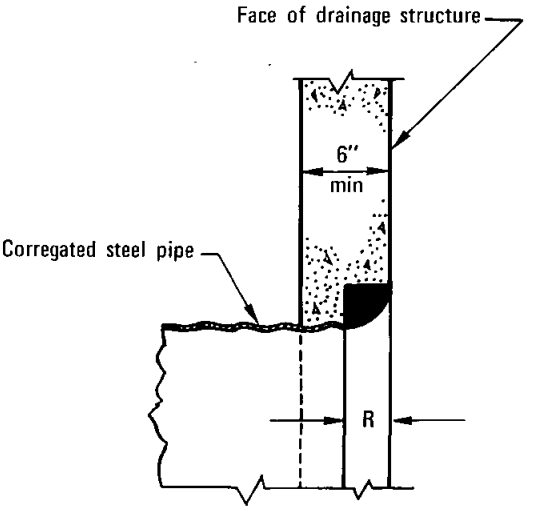
NOTES

1. For trenching on improved streets see Standard Drawing G - 24 or G - 25 for resurfacing details.
2. (*) indicates minimum relative compaction.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE Allan A Kenchmark Dec. 1975 Coordinator R.C.E. 19807 Date	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
DRAWING NUMBER D-60	PIPE BEDDING AND TRENCH BACKFILL FOR STORM DRAINS				



R = Thickness of pipe



R = $\frac{\text{Inside diameter of pipe}}{10}$

NOTE

The rounded areas may be built up of cement mortar or poured in place with the drainage structure.

Revision	By	Approved	Date

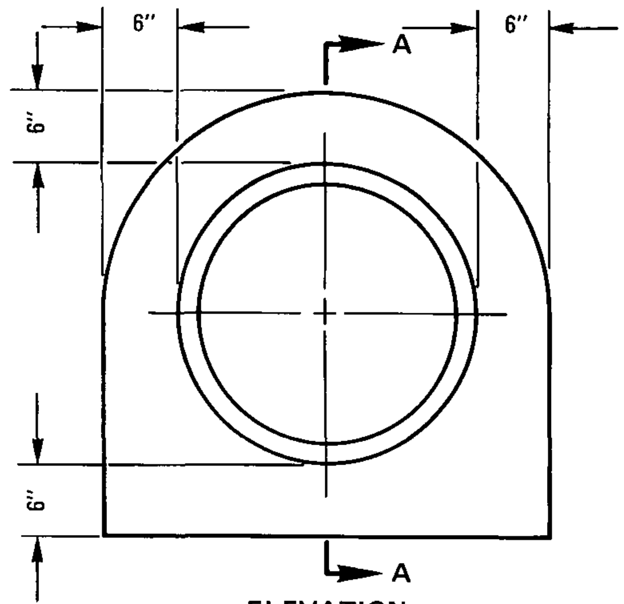
SAN DIEGO REGIONAL STANDARD DRAWING

ROUNDED PIPE ENDS IN DRAINAGE STRUCTURES

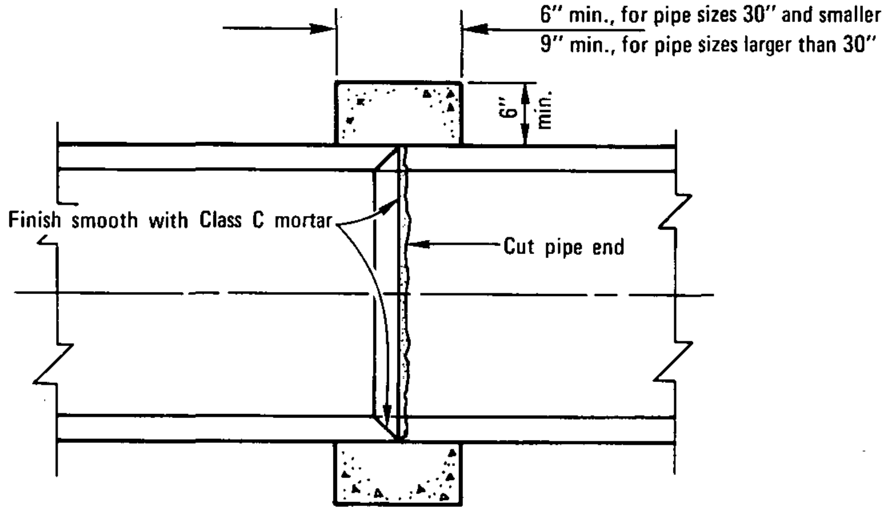
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER **D-61**



ELEVATION

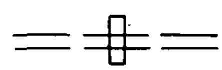


SECTION A–A

NOTES:

1. Pipe collar does not have to be finished if covered, but must have a minimum of 6" of concrete around joint.
2. Concrete shall be 564 - C - 3000

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

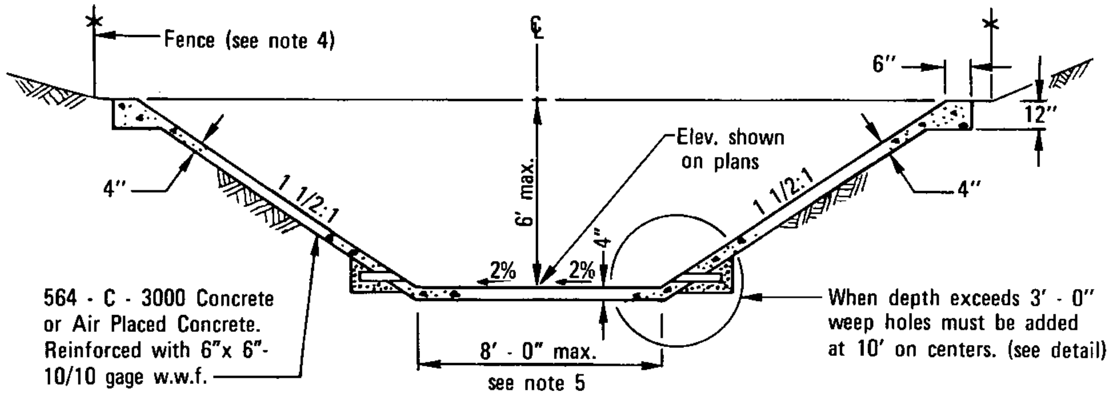
Allen A. Kuehne(?) — Dec. 1975
Coordinator R.C.E. 19807 — Date

SAN DIEGO REGIONAL STANDARD DRAWING

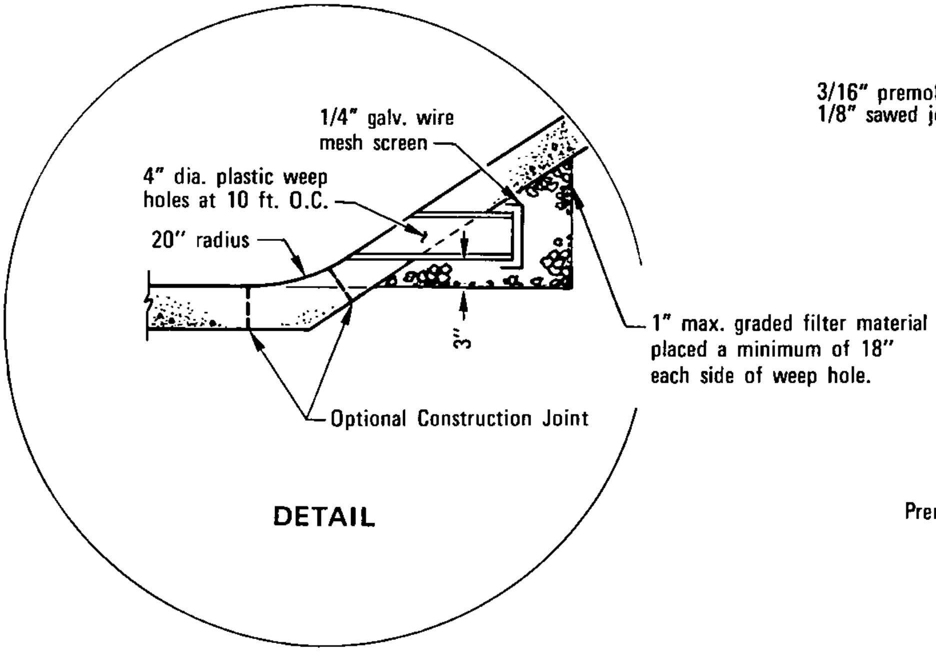
PIPE COLLAR

DRAWING NUMBER **D-62**

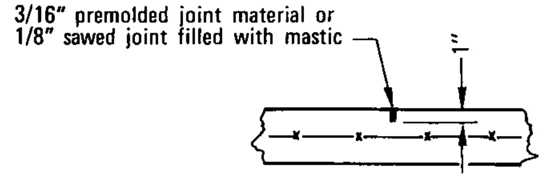
Revision	By	Approved	Date



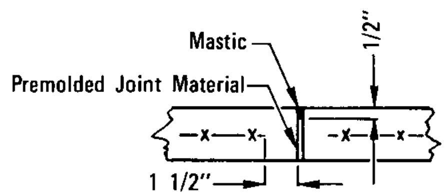
TYPICAL SECTION



DETAIL



WEAKENED PLANE JOINT

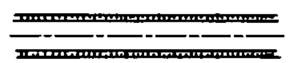


EXPANSION JOINT

NOTES

1. A.C. or clay pipe may be substituted for plastic pipe at weep holes.
2. Weakened plane joints shall be placed every 12' to 15'. Expansion joints shall be placed at all changes of section and at ends of curves.
3. Cutoff walls shall be constructed at each end of the channel along the full width of section. See Standard Drawing D-72.
4. Chainlink fence shall be as required by Agency.
5. For bottom widths greater than 8 feet see Standard Drawing D-71.
6. Reinforcement shown is minimum.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

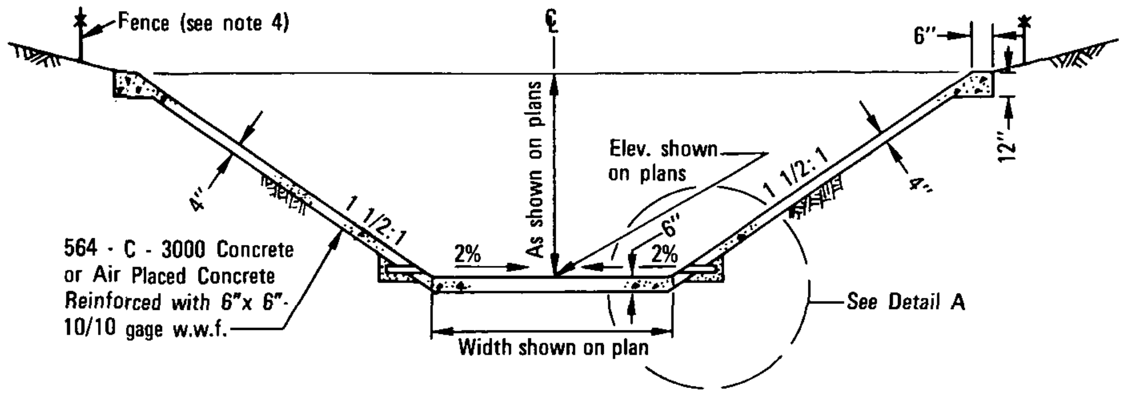
Allen A. Kershaw — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **D-70**

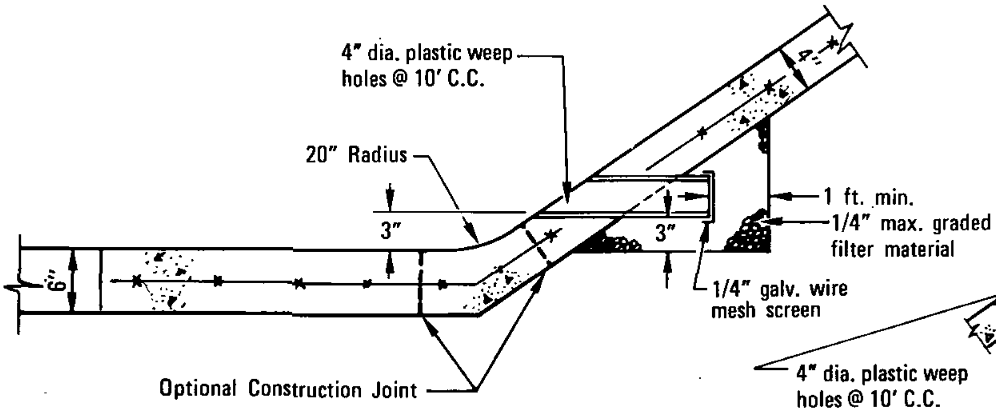
SAN DIEGO REGIONAL STANDARD DRAWING

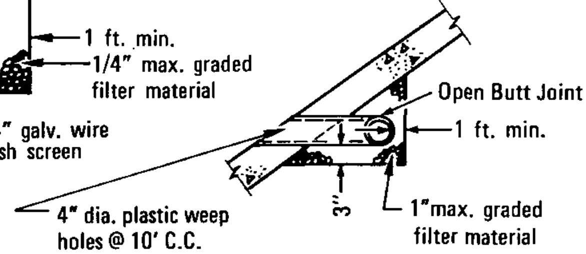
MINOR DRAINAGE CHANNEL

Revision	By	Approved	Date



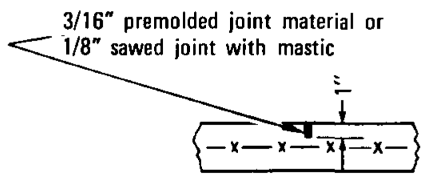
TYPICAL SECTION





ALT. CONTINUOUS DRAIN

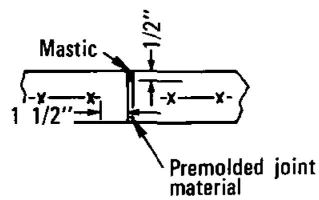
DETAIL A



WEAKENED PLANE JOINT

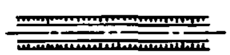
NOTES

1. A.C. or clay pipe may be substituted for plastic pipe at weep holes.
2. Weakened plane joints shall be placed every 12' to 15'. Expansion joints shall be placed at all changes of section and at ends of curves.
3. Cutoff walls shall be constructed at each end of the channel along the full width of section. See Standard Drawing D-72.
4. Chainlink fence shall be as required by Agency.
5. Reinforcement shown is minimum.



EXPANSION JOINT

LEGEND ON PLANS



Revision	By	Approved	Date

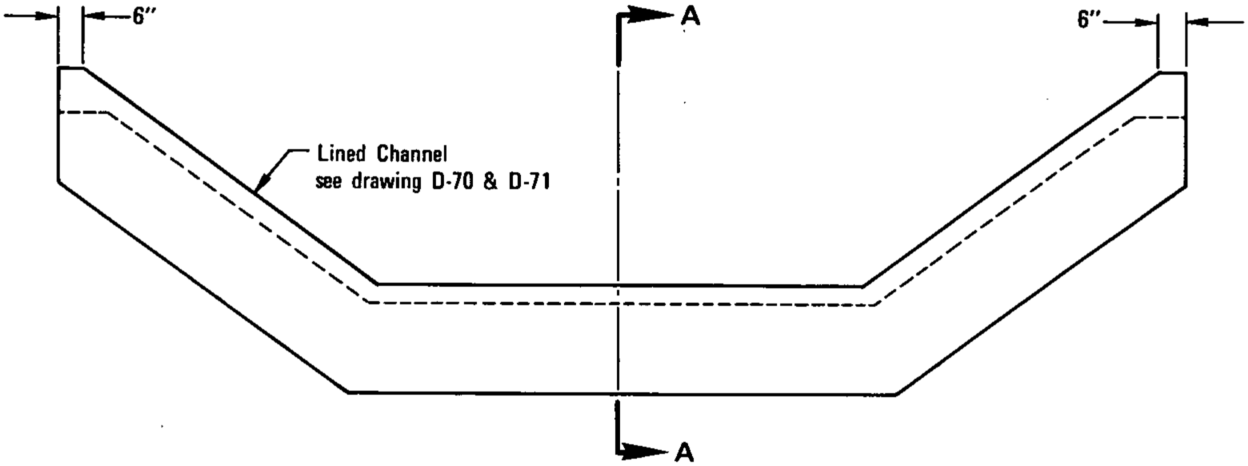
SAN DIEGO REGIONAL STANDARD DRAWING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

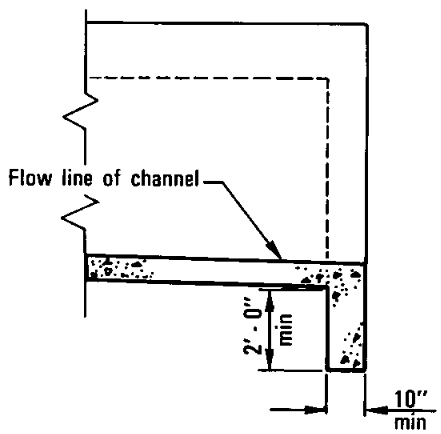
Allard A. Kuchard (signature) Dec. 1975
Coordinator R.C.E. 19807 Date

MAJOR DRAINAGE CHANNEL

DRAWING NUMBER **D-71**



ELEVATION

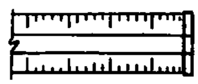


SECTION A—A

NOTES

1. Thickness and wall depth shall be as shown on plan.
2. Reinforcing in cutoff wall shall be the same as that required in channel.
3. Concrete shall be 564-C-3000.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

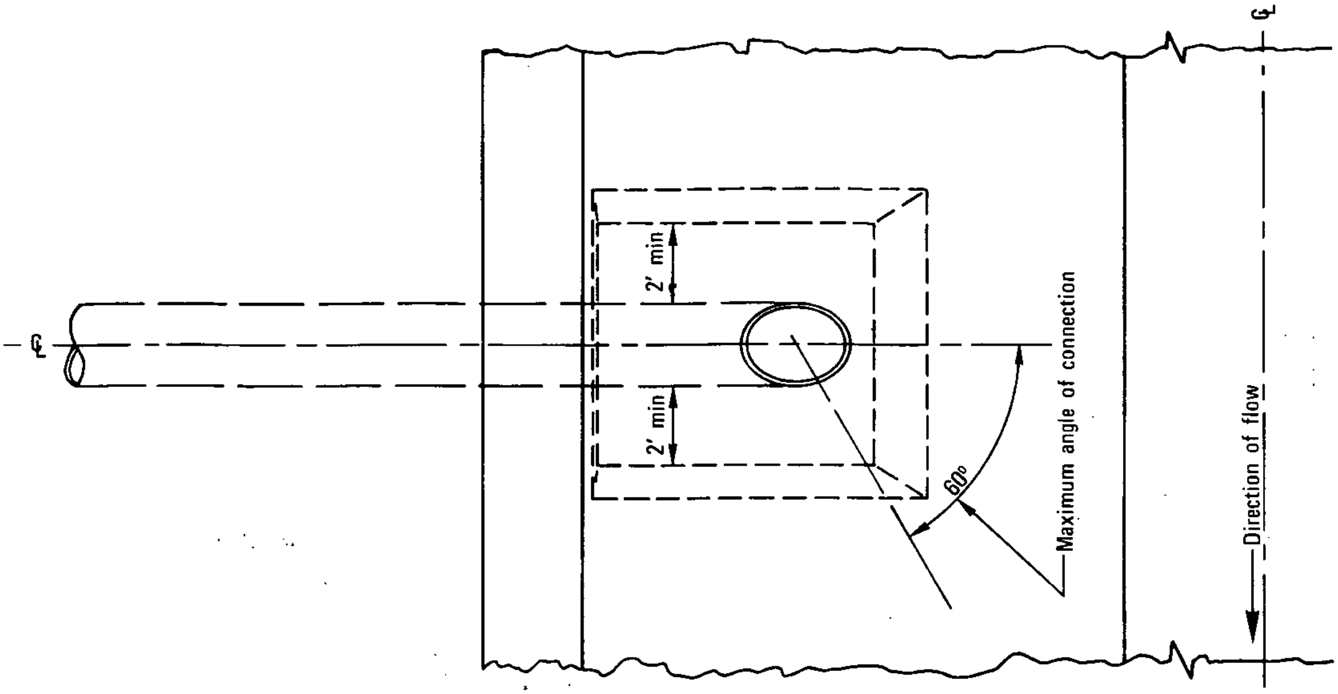
Allen A. Kershaw Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **D-72**

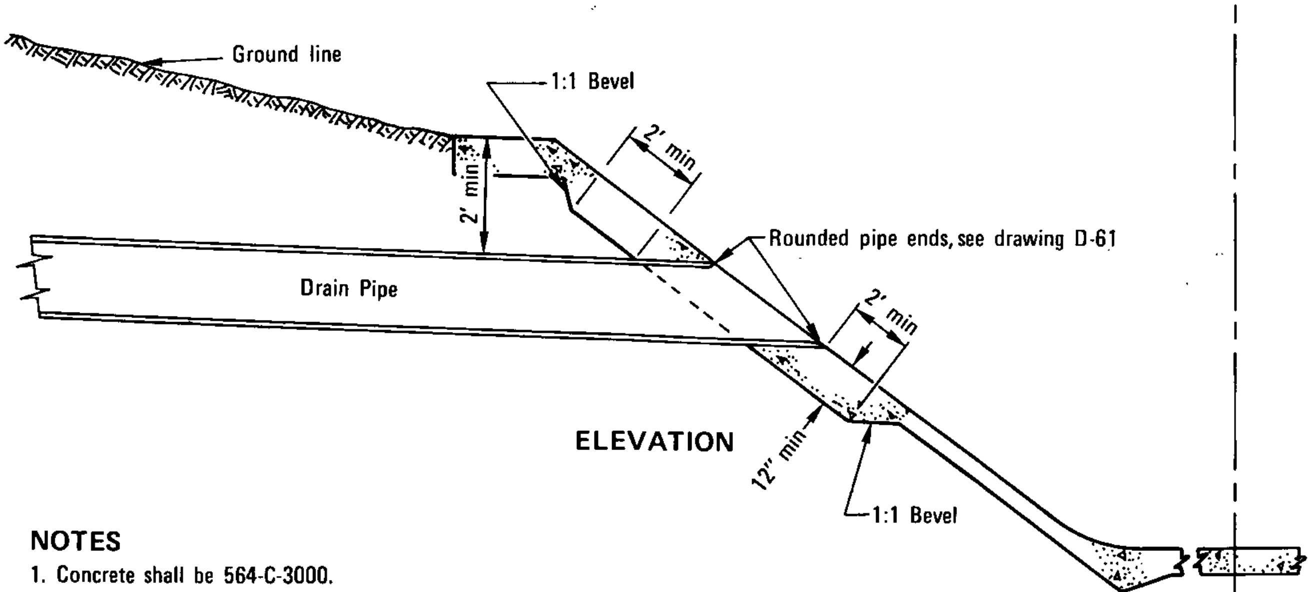
SAN DIEGO REGIONAL STANDARD DRAWING

CUTOFF WALL FOR DRAINAGE CHANNEL

Revision	By	Approved	Date



PLAN

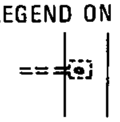


ELEVATION

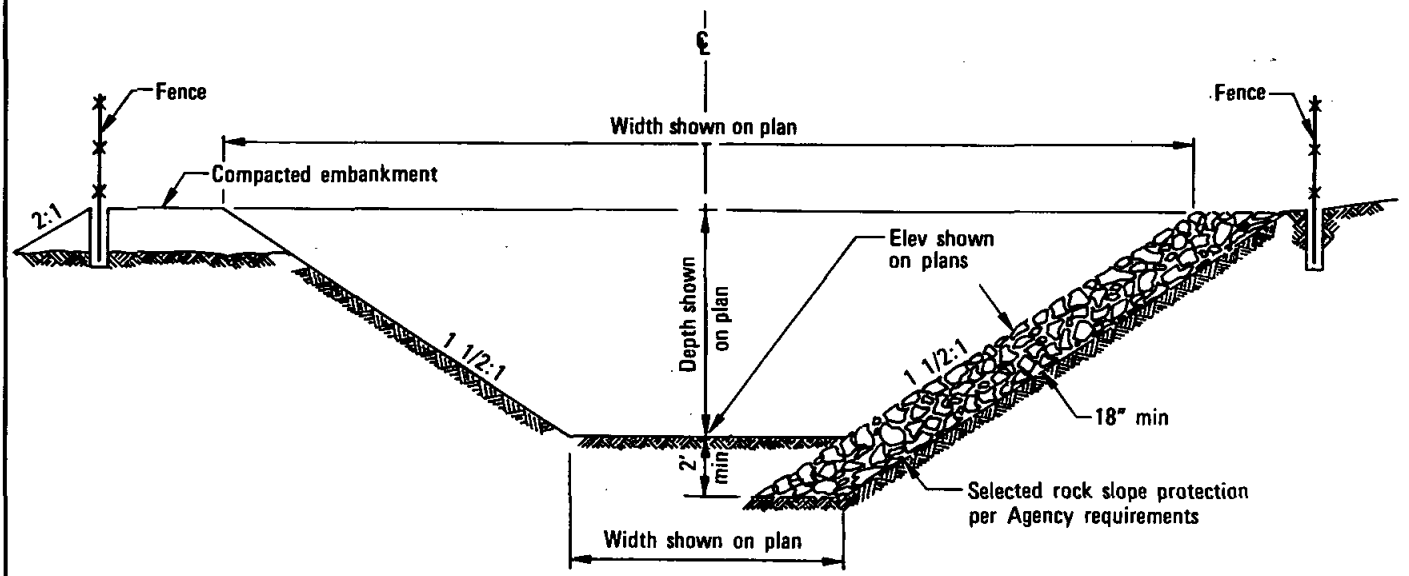
NOTES

1. Concrete shall be 564-C-3000.
2. Pipe shall connect to channel as high as possible.
3. The maximum angle of connection is 60° downstream. In no case shall a pipe angle upstream.

LEGEND ON PLANS



Revision	By	Approved	Date		
				SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
				PIPE TO CHANNEL CONNECTION	Allen A. Kerchival (signature) Dec. 1975 — Coordinator R.C.E. 19807 Date
					DRAWING NUMBER **D-73**



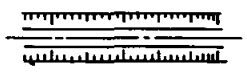
TYPICAL SECTION

NOTE

The following shall be as required by Agency:

a) Low flow channel
b) Filter blanket
c) Cutoff wall
d) Fence

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

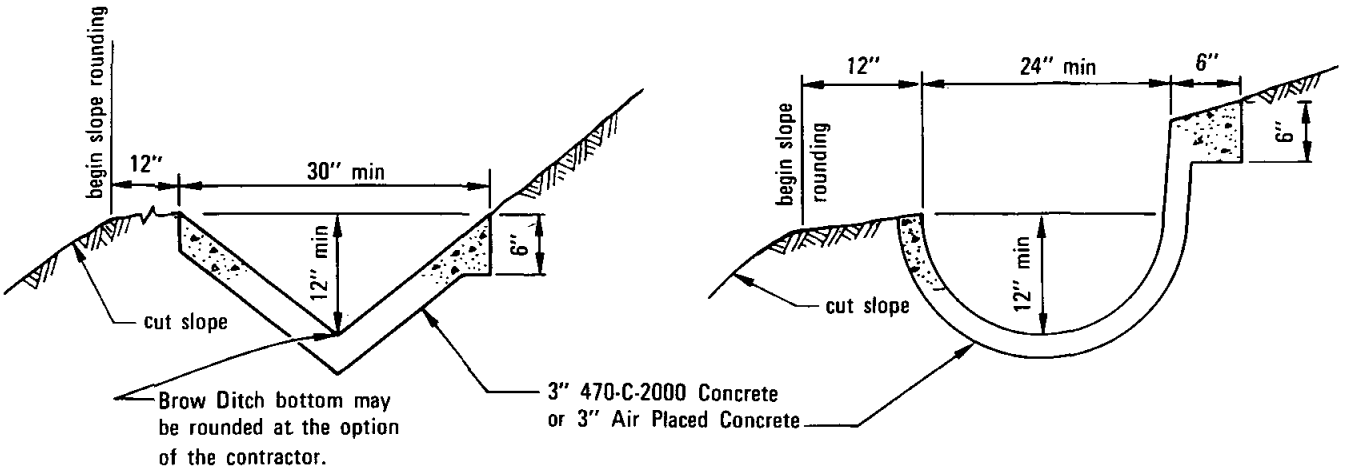
Allen A Kershaw Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER D-74

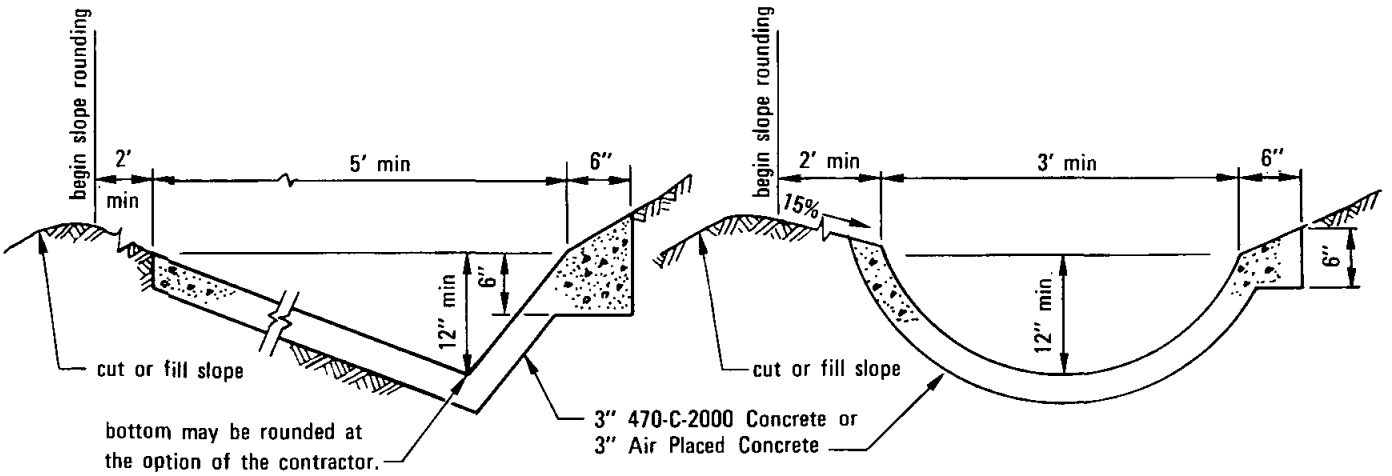
SAN DIEGO REGIONAL STANDARD DRAWING

GRADED EARTH CHANNEL

Revision	By	Approved	Date



BROW DITCH



TERRACE DITCH

NOTES

1. Longitudinal slope of lined ditch shall be 2% minimum.
2. Reinforcing, when required by Agency, shall be 1 1/2" x 1 1/2" 17 gage stucco netting.
3. Over slope down ditches shall employ 6" thickened edge section at both sides of ditch.

LEGEND ON PLANS

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

DRAINAGE DITCHES

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER **D-75**

SPAN	2'		3'			4'						5'											
HEIGHT	1'6"	2'	2'	3'		2'	3'		4'			2'		3'		4'				5'			
STRENGTH CLASSIFICATION	A	A	A	A	B	A	A	B	A	B	C	A	B	A	B	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	66		38	38	66	28	28	37	28	37	50	12	27	12	27	11	26	35	46	11	25	35	46
Conc. Top Slab T_1	6	6	6¼	6¼	8	7	7	8	7	8	9	7½	8	7½	8	7½	8	9½	10½	7½	8	9½	10½
Conc. Bottom Slab T_2	6	6	6¼	6¼	8	7	7	8	7	8	9	6	8	6	8	6	8	10	10¾	6	8	10	10¾
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size: Bar #	4	4	4	4	5	5	5	5	5	5	6	5	5	5	5	5	5	6	6	5	5	6	6
"a" Spacing	3½	3½	3½	3½	4	5	5	4½	5	4½	5	4	4	4	4	4	4	5	4½	4	4	5	4½
"a" Length	3-2	3-2	4-2	4-2	4-3	5-3	5-3	5-3	5-3	5-3	5-2	6-3	6-3	6-3	6-3	6-3	6-3	6-2	6-2	6-3	6-3	6-2	6-2
"d" Dist. Bars Top Slab - No. of	2	2	3	3	2	5	5	3	5	3	3	7	3	7	3	7	3		3	7	3		3
"d" Dist. Bars Bottom Slab - No. of	2	2	2	2	2	3	3		3		3	3		3		3			3	3	3		3
"e" Bars Spacing	18	18	18	18	12¼	18	18	18	17	13	9½	18	18	18	18	18	17	13	11	18	12	8½	6¼
Spacers Number	12	12	12	12		12	12		14			14		14		14				16			
Quan. Concrete: C.Y. per lin. ft.	17	.18	.23	.27	.31	.29	.33	.36	36	.40	43	.32	.37	.36	.41	.40	.44	51	.54	.43	.48	.55	.57
Quan. Reinf. lbs. per lin. ft.	27	29	34	36	46	44	45	47	48	52	64	57	56	59	57	61	60	68	75	63	65	77	87

SPAN	6'																				
HEIGHT	2'		3'		4'			5'				6'					7'				
STRENGTH CLASSIFICATION	A	B	A	B	A	B	C	A	B	C	D	A	B	C	D	E	A	B	C	D	E
MAX. FILL OVER TOP	10	18	10	18	10	18	25	9	18	25	36	9	17	25	36	45	9	17	25	36	45
Conc. Top Slab T_1	8¼	8¼	8¼	8¼	8¼	8¼	9¼	8¼	8¼	9¼	11	8¼	8¼	9¼	11	12	8¼	8¼	9¼	11	12
Conc. Bottom Slab T_2	6¾	8	6¾	8	6¾	8	9¾	7¼	8¼	10	11¼	7¼	8¼	10½	11¼	12¼	7¼	8¼	10½	11¼	12¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6¼	7	6	6	6¼	7	7¾
Reinforcing Steel "a" Size: Bar #	5	5	5	5	5	5	6	5	5	6	6	5	5	6	7	7	5	5	6	7	7
"a" Spacing	4	4	4	4	4	4	5	4	4	5	4½	4	4	5	5½	5	4	4	5	5½	5
"a" Length	7-3	7-3	7-3	7-3	7-3	7-3	7-2	7-3	7-3	7-2	7-2	7-3	7-3	7-2	7-3	7-5	7-3	7-3	7-2	7-5	7-6
"d" Dist. Bars Top Slab - No. of	7	4	7	4	7	4		7	4		4	7	4		4	4	7	4		4	4
"d" Dist. Bars Bottom Slab - No. of	4		4		4			4			4	4			4	4	4			4	4
"e" Bars Spacing	18	18	18	18	18	18	17	18	15½	11½	8½	17	10½	7½	6	5	12	7½	7	5	4½
Spacers Number	12		12		14			16				18					18				
Quan. Concrete: C.Y. per lin. ft.	.40	.42	.43	.46	.47	.50	.58	52	.54	.60	66	.56	.58	.65	.71	.78	.59	.61	.70	.78	.88
Quan. Reinf. lbs. per lin. ft.	64	63	66	65	69	67	74	70	70	80	91	73	78	92	112	127	81	90	99	126	139

Note:
For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

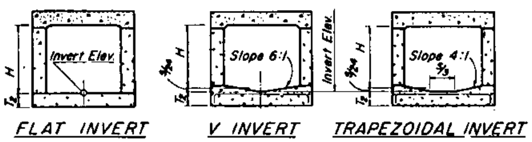
SPAN	7'												
HEIGHT	3'		4'		5'			6'			7'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	16	26	16	26	16	26	35	16	26	35	16	26	35
Conc. Top Slab T_1	7¼	8¼	7¼	8¼	7¼	8¼	9¾	7¼	8¼	9¾	7¼	8¼	9¾
Conc. Bottom Slab T_2	7½	8¾	7½	8¾	7½	8¾	10½	7½	8¾	10½	7½	8¾	10½
Conc. Sidewalls T_3	6	7	6	7	6	7	8½	6	7	8½	6	7	8½
"a" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"a" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"a" Length	6-8	6-9	6-8	6-9	6-8	6-9	6-10	6-8	6-9	6-10	6-8	6-9	6-10
"b" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"b" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"b" Dimension "X"	1-3	1-4	1-3	1-4	1-3	1-4	1-8	1-3	1-4	1-8	1-3	1-4	1-8
"b" Length	3-1	3-2	3-1	3-2	3-1	3-2	3-10	3-1	3-2	3-10	3-1	3-2	3-10
"c" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"c" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"c" Dimension "Y"	1-10	1-11	1-10	1-11	1-10	1-11	2-3	1-10	1-11	2-3	1-10	1-11	2-3
"c" Length	5-2	5-4	6-2	6-4	7-2	7-4	7-10	8-2	8-4	8-10	9-2	9-4	9-10
"c_1" Size: Bar #	5	5	5	5	5	5	6	5	5	6	5	5	6
"c_1" Spacing	9	7	9	7	9	7	9	9	7	9	9	7	9
"c_1" Dimension "Y"	1-10	1-11	1-10	1-11	1-10	1-11	2-3	1-10	1-11	2-3	1-10	1-11	2-3
"c_1" Length	3-8	3-10	3-8	3-10	3-8	3-10	4-6	3-8	3-10	4-6	3-8	3-10	4-6
"d" Bars Top Slab - No. of	7	4	7	4	7	4	4	7	4	4	7	4	4
"d" Bars Bottom Slab - No. of	4	4	4	4	4	4	4	4	4	4	4	4	4
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total Number	24		28		28			32			36		
Quan. Concrete: C.Y. per lin. ft.	.47	.56	.51	.60	.55	.64	.78	.58	.68	.84	.62	.73	.89
Quan. Reinf. lbs. per lin. ft.	107	130	114	138	118	143	168	125	150	176	132	158	184

SPAN	8'																
HEIGHT	3'		4'		5'		6'			7'				8'			
STRENGTH CLASSIFICATION	A	B	A	B	A	B	A	B	C	A	B	C		A	B	C	
MAX. FILL OVER TOP	13	21	13	21	13	21	13	21	31	13	21	31	—	13	21	31	—
Conc. Top Slab T_1	7¼	8½	7¼	8½	7¼	8½	7¼	8½	10¼	7¼	8½	10¼	—	7¼	8½	10¼	—
Conc. Bottom Slab T_2	7¼	9½	7¼	9½	7¼	9½	7½	9½	11½	7½	9½	11½	—	7½	9½	11½	—
Conc. Sidewalls T_3	6½	7½	6½	7½	6½	7½	6½	7½	9¾	6½	7½	9¾	—	6½	7½	9¾	—
"a" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	—	5	5	6	—
"a" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	—	9	7	8	—
"a" Length	7-7	7-8	7-7	7-8	7-7	7-8	7-7	7-8	7-10	7-7	7-8	7-10	—	7-7	7-8	7-10	—
"b" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	—	5	5	6	—
"b" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	—	9	7	8	—
"b" Dimension "X"	1-6	1-7	1-6	1-7	1-6	1-7	1-6	1-7	1-8	1-6	1-7	1-8	—	1-6	1-7	1-8	—
"b" Length	3-4	3-5	3-4	3-5	3-4	3-5	3-4	3-5	3-10	3-4	3-5	3-10	—	3-4	3-5	3-10	—
"c" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	—	5	5	6	—
"c" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	—	9	7	8	—
"c" Dimension "Y"	2-0	2-5	2-0	2-5	2-0	2-5	2-0	2-5	2-8	2-0	2-5	2-8	—	2-0	2-5	2-8	—
"c" Length	5-4	5-10	6-4	6-10	7-4	7-10	8-4	8-10	9-3	9-4	9-10	10-3	—	10-4	10-10	11-3	—
"c_1" Size: Bar #	5	5	5	5	5	5	5	5	6	5	5	6	—	5	5	6	—
"c_1" Spacing	9	7	9	7	9	7	9	7	8	9	7	8	—	9	7	8	—
"c_1" Dimension "Y"	2-0	2-5	2-0	2-5	2-0	2-5	2-0	2-5	2-8	2-0	2-5	2-8	—	2-0	2-5	2-8	—
"c_1" Length	3-9	4-5	3-9	4-5	3-9	4-5	3-9	4-5	5-0	3-9	4-5	5-0	—	3-9	4-5	5-0	—
"d" Bars Top Slab - No. of	7	5	7	5	7	5	7	5	5	7	5	5	—	7	5	5	—
"d" Bars Bottom Slab - No. of	5	5	5	5	5	5	5	5	5	5	5	5	—	5	5	5	—
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	—	18	18	18	—
Spacers Total Number	28		32		32		36			40				40			
Quan. Concrete: C.Y. per lin. ft.	.52	.65	.56	.70	.60	.74	.65	.79	1.00	.69	.83	1.06	—	.73	.86	1.12	—
Quan. Reinf. lbs. per lin. ft.	118	146	125	154	129	159	136	167	211	143	174	220	—	147	179	225	—

SPAN	10'																
HEIGHT	4'		5'		6'		7'		8'			9'			10'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	9	18	9	18	9	18	9	18	8	18	28	8	18	28	8	18	28
Conc. Top Slab T_1	8	9½	8¼	9¾	8¼	9¾	8½	9¾	8½	9¾	12¼	8½	9¾	12¼	8½	9¾	12¼
Conc. Bottom Slab T_2	8¾	10½	9	10¾	9	10¾	9¼	11	9¼	11	13¼	9¼	11	13¼	9¼	11	13½
Conc. Sidewalls T_3	7¼	9½	7¼	9½	7¼	9½	7¼	9½	7¼	9½	11½	8	9½	11½	9	9½	11½
"a" Size: Bar #	6	6	6	6	6	6	6	6	6	6	7	6	6	7	6	6	7
"a" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"a" Length	9-5	9-8	9-5	9-8	9-5	9-8	9-5	9-8	9-5	9-8	9-9	9-6	9-8	9-9	9-7	9-8	9-9
"b" Size: Bar #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
"b" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"b" Dimension "X"	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-6	2-0	2-0	2-6	2-0	2-0	2-6
"b" Length	3-10	4-2	3-10	4-2	3-10	4-2	3-10	4-2	3-10	4-2	4-8	3-10	4-2	4-8	3-10	4-2	4-8
"c" Size: Bar #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
"c" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"c" Dimension "Y"	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	3-6	2-8	3-4	3-6	2-8	3-4	3-6
"c" Length	6-11	7-10	8-1	8-10	9-1	9-10	10-1	10-10	11-1	11-10	12-3	12-1	12-10	13-3	13-1	13-10	14-3
"c_1" Size: Bar #	5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
"c_1" Spacing	11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
"c_1" Dimension "Y"	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	3-6	2-8	3-4	3-6	2-8	3-4	3-6
"c_1" Length	4-7	5-8	4-7	5-8	4-7	5-8	4-7	5-8	4-7	5-8	6-0	4-7	5-8	6-0	4-7	5-8	6-2
"d" Bars Top Slab - No. of	9	5	9	5	9	5	9	5	9	5	5	9	5	5	9	5	5
"d" Bars Bottom Slab - No. of	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total Number	32		34		36		40		40			44			48		
Quan. Concrete: C.Y. per lin. ft.	.75	.94	.82	1.02	.86	1.08	.92	1.15	.97	1.21	1.50	1.06	1.26	1.57	1.18	1.32	1.65
Quan. Reinf. lbs. per lin. ft.	143	221	148	228	154	235	160	244	164	250	265	170	259	273	178	267	281

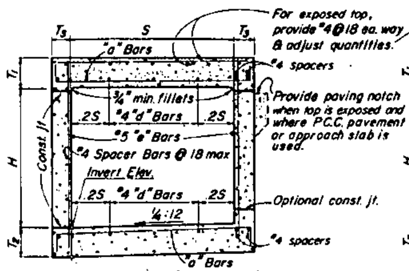
SPAN	12'														
HEIGHT	6'		7'		8'		9'			10'			12'		
STRENGTH CLASSIFICATION	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX. FILL OVER TOP	5	16	5	16	5	16	5	16	24	5	16	24	5	16	24
Conc. Top Slab T_1	8¾	11¼	8¾	11¼	8¾	11¼	9	11¼	13¼	9	11¼	13¼	9	11¼	13¼
Conc. Bottom Slab T_2	8¾	12¼	8¾	12¼	8¾	12¼	9	12¼	14¾	9	12¼	14¾	9	12¼	14¾
Conc. Sidewalls T_3	7½	10½	7½	10½	7½	10½	8	10½	12½	9	10½	12½	9	10½	12½
"a" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"a" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"a" Length	11-3	11-6	11-3	11-6	11-3	11-6	11-4	11-6	11-8	11-5	11-6	11-8	11-5	11-6	11-8
"b" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"b" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"b" Dimension "X"	2-8	3-0	2-8	3-0	2-8	3-0	2-8	3-0	3-0	2-8	3-0	3-0	2-8	3-0	3-0
"b" Length	4-10	5-7	4-10	5-7	4-10	5-7	4-10	5-7	5-7	4-10	5-7	5-7	4-10	5-7	5-7
"c" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"c" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"c" Dimension "Y"	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
"c" Length	10-2	10-4	11-2	11-4	12-2	12-4	13-2	13-4	13-6	14-2	14-4	14-6	15-2	15-4	15-6
"c_1" Size: Bar #	6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
"c_1" Spacing	11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
"c_1" Dimension "Y"	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
"c_1" Length	5-11	6-5	5-11	6-5	5-11	6-6	5-11	6-6	6-8	5-11	6-6	6-8	5-11	6-6	6-8
"d" Bars Top Slab - No. of	10	6	10	6	10	6	10	6	6	10	6	6	10	6	6
"d" Bars Bottom Slab - No. of	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Spacing	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Spacers Total Number	36		44		44		44			48			52		
Quan. Concrete: C.Y. per lin. ft.	.99	1.38	1.03	1.44	1.08	1.52	1.18	1.58	1.90	1.30	1.65	1.98	1.41	1.78	2.13
Quan. Reinf. lbs. per lin. ft.	203	293	213	304	218	311	223	317	387	231	326	397	243	341	415

⊛ For reinforcement clearance, except at bottom, see "Miscellaneous Details."

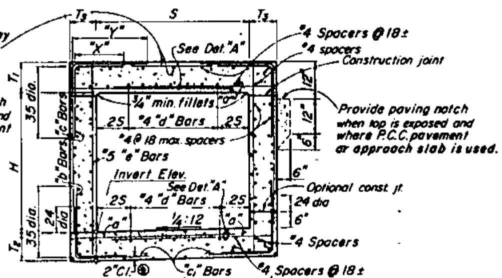


FLAT INVERT V INVERT TRAPEZOIDAL INVERT

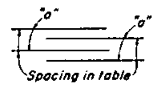
ALTERNATIVE INVERTS
(When shown)



TYPICAL SECTIONS 2' THRU 6' SPANS



TYPICAL SECTION 7' THRU 12' SPANS



DETAIL "A"

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

[signature]
Coordinator R.C.E. 19807 Dec. 1975
Date

SAN DIEGO REGIONAL STANDARD DRAWING

SINGLE BOX CULVERT

Revision	By	Approved	Date

DRAWING NUMBER D-76

SPAN	4'										
HEIGHT	2'			3'				4'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	11	21	32	11	23	34	46	11	23	34	46
Conc. Top Slab T_1	6½	6½	7¼	6½	6½	7½	8½	6½	6½	7½	8½
Conc. Bottom Slab T_2	6	7¼	8½	6	7½	8½	9½	6	7½	8½	9½
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size: Bar #	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½
"a" Length	10-3	10-2	10-2	10-3	10-2	10-2	10-2	10-3	10-2	10-2	10-2
"b" or "b_1" Size: Bar #	5	5	5	5	5	5	5	5	5	5	5
Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½
Length "b"	9-4	9-4	9-6	9-4	9-4	9-6	9-7	9-4	9-4	9-6	9-7
Length "b_1"	9-4	9-5	9-6	9-4	9-5	9-6	9-7	9-4	9-5	9-6	9-7
"c" Size: Bar #	4	5	5	4	5	5	5	4	5	5	5
"c" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½
"c" Length	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6	4-6
"d" Dist. Bars Top Slab-Tot. No.	10	6	6	10	6	6	6	10	6	6	6
"d" Dist. Bars Bottom Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	4	4	5
"e" Bars Spacing	18	18	18	18	18	16	12	18	12	9	10
Spacers Number	23			26				29			
Quan. Concrete: C.Y. per lin ft.	0.47	0.51	0.57	0.53	0.57	0.63	0.69	0.59	0.63	0.69	0.75
Quan. Reinf. : Lbs per lin ft.	81	74	84	84	79	91	101	87	85	99	111

SPAN	5'													
HEIGHT	2'			3'			4'				5'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	6	24	36	6	24	36	6	23	34	46	6	23	34	46
Conc. Top Slab T_1	6¾	7¾	9¼	6¾	7¾	9¼	6¾	7¾	9	10¼	6¾	7¾	9¼	10¼
Conc. Bottom Slab T_2	6½	8¾	10¼	6½	8¾	10¼	6½	8¾	10	11¼	6½	8¾	10¼	11¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size: Bar #	5	4	4	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
"a" Length	12-3	12-2	12-2	12-3	12-2	12-2	12-3	12-2	12-2	12-2	12-3	12-2	12-2	12-2
"b" or "b_1" Size: Bar #	5	5	6	5	5	6	5	5	6	6	5	5	6	6
Spacing	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
Length "b"	11-5	11-6	11-7	11-5	11-6	11-7	11-5	11-6	11-7	11-8	11-5	11-6	11-7	11-8
Length "b_1"	11-4	11-6	11-7	11-4	11-6	11-7	11-4	11-6	11-7	11-8	11-4	11-6	11-7	11-8
"c" Size: Bar #	4	5	6	4	5	6	4	5	6	6	4	5	6	6
"c" Spacing	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
"c" Length	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6
"d" Dist. Bars Top Slab-Tot. No.	12	6	6	12	6	6	12	6	6	6	12	6	6	6
"d" Dist. Bars Bottom Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	4	5	4	4	5	6
"e" Bars Spacing	18	18	18	18	18	16	18	12	10	10½	18	8½	9	9
Spacers Number	23			26			29				32			
Quan. Concrete: C.Y. per lin ft.	0.58	0.69	0.80	0.63	0.75	0.86	0.69	0.80	0.89	0.96	0.74	0.86	0.97	1.04
Quan. Reinf. : Lbs per lin ft.	99	100	109	103	104	112	106	109	119	133	109	116	126	148

SPAN	6'													
HEIGHT	3'			4'			5'				6'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	4	20	34	4	20	34	4	19	33	43	4	19	33	43
Conc. Top Slab T_1	7¼	8¼	10½	7¼	8¼	10½	7¼	8¼	10½	12	7¼	8¼	10½	12
Conc. Bottom Slab T_2	7¼	9½	11½	7¼	9½	11½	7¼	9½	11½	12¾	7¼	9½	11½	12¾
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	7½
Reinforcing Steel "a" Size: Bar #	5	4	4	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½
"a" Length	14-3	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-2	14-3	14-2	14-2	14-8
"b" or "b_1" Size: Bar #	5	6	6	5	6	6	5	6	6	7	5	6	6	7
Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½
Length "b"	13-6	13-6	13-6	13-6	13-6	13-8	13-6	13-6	13-8	13-9	13-6	13-6	13-8	14-2
Length "b_1"	13-5	13-7	13-8	13-5	13-7	13-8	13-5	13-6	13-8	13-9	13-5	13-6	13-8	14-2
"c" Size: Bar #	4	6	6	4	6	6	4	6	6	7	4	6	6	7
"c" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½
"c" Length	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-6	6-8
"d" Dist. Bars Top Slab-Tot. No.	12	6	6	12	6	6	12	6	6	6	12	6	6	6
"d" Dist. Bars Bottom Slab-Tot. No.	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars Size: Bar #	4	4	4	4	4	4	4	4	5	5	4	5	6	6
"e" Bars Spacing	18	18	16	18	14	8½	18	10	9½	7	18	11	9	6
Spacers Number	30			33			36				36			
Quan. Concrete: C.Y. per lin ft.	0.77	0.90	1.08	0.82	0.96	1.13	0.88	1.01	1.19	1.30	0.93	1.07	1.25	1.47
Quan. Reinf. : Lbs per lin ft.	121	119	147	125	124	155	128	131	164	175	129	137	177	201

SPAN	8'																
HEIGHT	4'			5'			6'			7'				8'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	3	14	25	3	14	25	3	14	25	3	14	25	37	3	14	25	37
Conc. Top Slab T_1	8½	9½	12	8½	9½	12	8½	9½	12	8½	9½	12¼	14¼	8½	9½	12¼	14¼
Conc. Bottom Slab T_2	7½	10½	12¾	7½	10¾	12¾	7½	10¾	12¾	7½	10¾	13	15	7½	10¾	13	15¼
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6	6	7	7	7	8	7	7	8	8½
Reinforcing Steel "a" Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
"a" Spacing	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
"a" Length	18-4	18-2	18-2	18-4	18-2	18-2	18-4	18-2	18-2	18-7	18-5	18-5	18-8	18-7	18-5	18-8	18-10
"b" or "b_1" Size: Bar #	6	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7
Spacing	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
Length "b"	17-7	17-8	17-9	17-7	17-8	17-9	17-7	17-8	17-9	17-10	17-10	18-0	18-5	17-10	17-10	18-3	18-6
Length "b_1"	17-5	17-8	17-9	17-5	17-8	17-9	17-5	17-8	17-9	17-8	17-11	18-0	18-5	17-8	17-11	18-0	18-7
"c" Size: Bar #	4	6	7	4	6	7	4	6	7	4	6	7	7	4	6	7	7
"c" Spacing	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
"c" Length	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-7	8-7	8-7	8-8	8-7	8-7	8-8	8-9
"d" Dist. Bars Top Slab-Tot. No.	16	8	8	16	8	8	16	8	8	16	8	8	8	16	8	8	8
"d" Dist. Bars Bottom Slab-Tot. No.	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"e" Bars Size: Bar #	4	4	4	4	4	5	4	5	6	4	5	6	7	4	5	7	7
"e" Bars Spacing	18	18	10½	18	12	10	18	11½	10	14	9½	7½	8½	11½	8½	7½	8
Spacers Number	41			44			44			47			56	50		60	
Quan. Concrete: C.Y. per lin ft.	1.08	1.30	1.55	1.14	1.37	1.61	1.19	1.42	1.66	1.32	1.56	1.85	2.14	1.39	1.62	1.99	2.27
Quan. Reinf. : Lbs per lin ft.	169	175	200	172	181	218	173	188	229	185	199	248	299	191	207	284	314

SPAN	10'																
HEIGHT	5'			6'			7'			8'				10'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	2	17	30	2	17	30	2	17	30	2	16	29	36	2	16	29	36
Conc. Top Slab T_1	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	17¼	8¾	12¾	16	17½
Conc. Bottom Slab T_2	8¼	13½	16½	8¼	13½	16½	8¼	13¾	16¾	8¾	13½	16½	18¼	8¾	13½	16½	18½
Conc. Sidewalls T_3	6	6	6	6	6	6	6	6½	7	7	7	7½	8½	8	8	9	10
Reinforcing Steel "a" Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
"a" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9
"a" Length	22-4	22-2	22-2	22-4	22-2	22-2	22-4	22-4	22-5	22-7	22-5	22-7	22-10	22-10	22-8	22-11	23-2
"b" or "b_1" Size: Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8
Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9
Length "b"	21-7	21-10	22-0	21-7	21-10	22-0	21-7	21-11	22-3	21-10	22-1	22-4	22-9	22-1	22-4	22-9	23-1
Length "b_1"	21-5	21-10	22-0	21-5	21-10	22-0	21-5	21-11	22-3	21-9	22-0	22-4	22-9	22-0	22-3	22-8	23-2
"c" Size: Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8
"c" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9
"c" Length	10-6	10-6	10-6	10-6	10-6	10-6	10-6	10-7	10-7	10-7	10-7	10-8	10-9	10-8	10-8	10-9	10-10
"d" Dist. Bars Top Slab-Tot. No.	18	10	10	18	10	10	18	10	10	18	10	10	10	18	10	10	10
"d" Dist. Bars Bottom Slab-Tot. No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" Bars Size: Bar #	4	4	5	4	4	5	4	4	6	4	5	6	7	4	6	6	7
"e" Bars Spacing	18	10	10	18	6	6½	14	6	8	11	8½	6	6	7½	7	5½	5
Spacers Number	48			48			51			54			64	68			
Quan. Concrete: C.Y. per lin ft.	1.40	2.05	2.46	1.45	2.07	2.48	1.51	2.18	2.64	1.68	2.27	2.74	3.04	1.92	2.51	3.05	3.41
Quan. Reinf. : Lbs per lin ft.	236	254	310	238	274	324	243	280	339	252	278	355	430	279	327	400	476

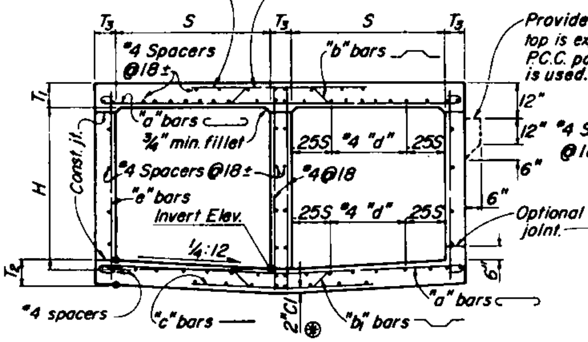
SPAN	12'																				
HEIGHT	6'			7'			8'			9'				10'				12'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	2	14	26	2	14	26	2	14	26	2	14	26	36	2	14	26	36	2	14	26	36
Conc. Top Slab T_1	10	14	17½	10	14¼	17½	10¼	14¼	17¾	10¼	14½	17¾	20¾	10¼	14½	17¾	20¾	10¼	14½	18¼	21¼
Conc. Bottom Slab T_2	9¼	14¾	18	9¼	15	18¼	9¾	15	18½	10	15¼	18¾	21¼	10¼	15¼	18¾	21½	10½	15¼	19¼	22
Conc. Sidewalls T_3	6	6	6½	7	7	7	8	8	8½	9	9	9	10	9	9	9½	11	9	10	11	12
Reinforcing Steel "a" Size: Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	4
"a" Spacing	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
"a" Length	26-4	26-2	26-4	26-7	26-5	26-5	26-10	26-8	26-10	27-1	26-11	26-11	27-1	27-1	26-11	27-5	27-5	27-1	27-2	27-5	27-8
"b" or "b_1" Size: Bar #	6	8	8	6	8	8	6	8	8	6	8	8	9	6	8	8	9	6	8	8	9
Spacing	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
Length "b"	25-8	25-10	26-3	25-11	26-1	26-4	26-2	26-4	26-9	26-5	26-8	26-10	27-4	26-5	26-8	27-2	27-6	26-5	26-11	27-5	27-10
Length "b_1"	25-6	25-10	26-3	25-9	26-2	26-4	26-1	26-5	26-9	26-4	26-8	26-11	27-4	26-4	26-8	27-2	27-7	26-4	26-11	27-5	27-11
"c" Size: Bar #	5	8	8	5	8	8	5	8	8	5	8	8	9	5	8	8	9	5	8	8	9
"c" Spacing	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
"c" Length	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-9	12-9	12-9	12-9	12-10	12-9	12-9	12-10	12-11	12-9	12-10	12-11	13-0
"d" Dist. Bars Top Slab-Tot. No.	24	10	10	24	10	10	24	10	10	24	10	10	10	24	10	10	10	24	10	10	10
"d" Dist. Bars Bottom Slab-Tot. No.	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" Bars Size: Bar #	4	4	5	4	4	5	4	4	5	4	5	7	8	4	7	8	8	6	7	8	9
"e" Bars Spacing	18	8	8	15	6	6½	12	5½	6	9	7½	8½	8	8½	11	8½	9	12	8	7	7
Spacers Number	52			55			68			68				72				76			
Quan. Concrete: C.Y. per lin ft.	1.84	2.59	3.16	1.97	2.77	3.28	2.19	2.93	3.59	2.36	3.15	3.69	4.25	2.48	3.23	3.86	4.49	2.67	3.53	4.30	4.92
Quan. Reinf. : Lbs per lin ft.	309	317	401	316	330	415	336	363	460	345	374	485	578	351	394	519	582	371	427	567	673

⊛ For reinforcement clearance, except at bottom, see "Miscellaneous Details."

Note:

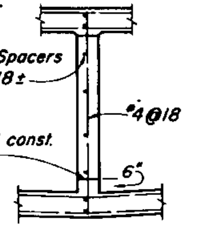
For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities. Number of "d" bars in table is slab total for both cells.

For exposed top, extend "c" bars full length, top slab only, provide additional #4 spacers @18± and adjust quantities.

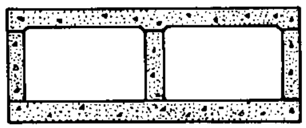


TYPICAL SECTION

(Showing reinforcement for interior walls 8" and over.)



Reinforcement for interior walls under 8.″



"FLAT INVERT" ALTERNATIVE

(When shown)

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

DOUBLE BOX CULVERT

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

[signature] Dec. 1975

Coordinator R.C.E. 19807 Date

DRAWING NUMBER D-77

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 Date 1975

DRAWING NUMBER D-78

SAN DIEGO REGIONAL STANDARD DRAWING

TRIPLE BOX CULVERT

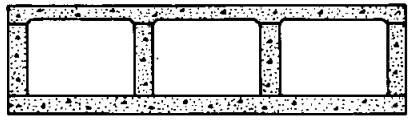
Revision	By	Approved	Date

SPAN		4'									5'										6'											8'											
HEIGHT		2'			3'			4'			2'			3'			4'			5'				3'			4'			5'				6'										
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP		10	24	38	10	24	38	10	24	38	8	17	26	8	17	26	8	17	26	35	8	17	26	35	3	13	23	3	13	23	30	3	13	23	30	2	11	20	28	2	11	20	28
Conc.	Top Slab T_1	6¼	6¼	7¼	6¼	6¼	7¼	6¼	6¼	7¼	6⅜	6⅜	7¼	6⅜	6⅜	7¼	6⅜	6⅜	7¼	8¼	6⅜	6⅜	7¼	8¼	7¼	7¼	8¼	7½	7½	8¼	9¼	7½	7½	8¼	9¼	8¼	8¼	10¼	8¼	8¼	10¼	11¼	8¼	8¼	10¼	11½
	Bottom Slab T_2	6	7	8¼	6	7	8¼	6	7	8¼	6¼	7¼	8½	6¼	7¼	8½	6¼	7¼	8½	9½	6¼	7½	8½	9½	6	7¾	9¼	6	7¾	9¼	10	6	8	9¼	10	6½	9	11	6½	9¼	11	6¾	9¼	11	12¼
	Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Steel	a — Size: Bar #	5	5	5	5	4	5	5	4	5	5	5	5	5	5	5	5	4	5	5	5	4	5	5	6	5	5	6	5	5	5	6	5	5	5	6	5	5	6	5	5	6	5	5	6
	Spacing	11	11½	13	11	11½	13	11	11½	13	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½	13	14	11½	13	14	11½	10	13	14	11½	10	11½	12	12	11½	12	12	11½	12	12	10½
	Length	14-9	14-8	14-9	14-9	14-8	14-9	14-9	14-8	14-9	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-8	17-9	17-9	17-9	17-8	17-9	17-9	20-0	20-5	20-9	20-0	20-5	20-9	20-9	20-0	20-5	20-9	20-9	20-0	20-9	20-9	20-9	20-0	20-9	20-9	20-9	26-0	26-5	26-9	26-9
	b or b_1 — Size: Bar #	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	5	5	6	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	7	7	6	6	7	7
	Spacing	11	11½	13	11	11½	13	11	11½	13	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½	13	14	11½	13	14	11½	10	13	14	11½	10	11½	12	12	11½	12	12	11½	12	12	10½
	Length "b"	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	20-3	20-3	20-8	20-3	20-3	20-8	20-9	20-3	20-3	20-8	20-9	20-3	20-3	20-8	20-9	20-3	20-3	20-8	20-9	26-3	26-8	26-7	26-9
	Length "b_1"	14-0	14-2	14-3	14-0	14-2	14-3	14-0	14-2	14-3	17-0	17-2	17-4	17-0	17-2	17-4	17-0	17-2	17-4	17-5	17-0	17-2	17-4	17-5	20-0	20-2	20-8	20-0	20-2	20-8	20-9	20-0	20-3	20-8	20-9	20-0	20-3	20-8	20-9	20-0	20-3	20-8	20-9	26-0	26-4	26-7	26-9
Reinforcing	c — Size: Bar #	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	6	4	5	6	6	4	6	6	4	6	6	6	4	6	6	6	4	6	7	6	4	6	7	7	4	6	7	7
	Spacing	11	11½	13	11	11½	13	11	11½	13	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½	13	14	11½	13	14	11½	10	13	14	11½	10	11½	12	12	11½	12	12	11½	12	12	10½
	Length	9-0	9-0	9-0	9-0	9-0	9-0	9-0	9-0	9-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	17-0	17-0	17-0	17-0
	"d" Dist. Bars — Top Slab-Tot. No.	15	9	9	15	9	9	15	9	9	18	9	9	18	9	9	18	9	9	9	18	9	9	9	18	9	9	18	9	9	9	18	9	9	9	24	12	12	24	12	12	24	12	12	24	12	12
	Bottom Slab-Tot. No.	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	12	12	12	12	12	12	12	12	12	12	12	12
	"e" Bars — Size: Bar #	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	5	4	4	4	6	4	4	4	4	4	4	5	5	4	4	6	6	4	4	4	4	4	5	4	5	6	4	6
	Spacing	18	18	18	18	18	13	18	11½	13	18	18	18	18	18	18	17	11½	11½	18	11	7	11½	18	18	18	18	18	18	11½	12	10	18	18	12	10	18	18	12	10	18	18	12	10	11½	12	10
	Spacers Number	34			38			42			34			38			38			42	40				40			52				48				58				62				66				70				88
Quan.	Concrete: C.Y. per lin. ft	0.67	0.71	0.81	0.79	0.79	0.89	0.82	0.86	0.96	0.82	0.87	0.98	0.90	0.95	1.05	0.97	1.02	1.13	1.23	1.04	1.11	1.20	1.31	1.05	1.15	1.29	1.12	1.23	1.37	1.49	1.32	1.44	1.55	1.67	1.39	1.52	1.64	1.47	1.67	1.99	1.54	1.76	2.06	1.82	1.84	2.14
	Reinf. : Lbs per lin. ft.	122	110	133	127	115	136	131	122	147	150	126	153	155	130	157	157	136	161	181	161	143	171	192	181	168	196	183	170	200	187	177	209	235	192	187	221	249	261	250	301	266	257	310	267	264	320

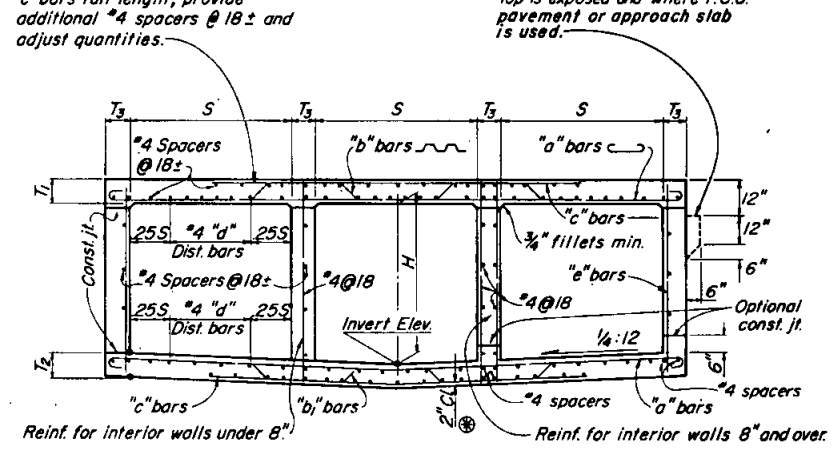
SPAN		10'										12'																					
HEIGHT		5'			6'			7'			8'				10'				6'			7'			8'			9'			10'			12'			
STRENGTH CLASSIFICATION		A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP		2	11	20	2	11	20	2	11	20	2	11	20	28	2	11	20	28	2	10	18	2	10	18	2	10	18	2	11	20	30	2	11	20	30	2	11	20	30
Conc.	Top Slab T_1	9	10	12	9	10	12	9	10	12	9	10	12	14¼	9	10¼	12¼	14¼	10¼	11¼	14	10¼	11¼	14	10¼	11¼	14	10¼	12	14¾	17¾	10¼	12	14¾	17¾	10¼	12	14¾	17¾
	Bottom Slab T_2	7½	10¾	13	7½	10¾	13	7½	10¾	13	7¾	11	13	15	8	11	13¼	15	8¼	12	14½	8½	12	14¾	8½	12	14¾	8½	12¼	15¼	18¼	8½	12¼	15¼	18¼	9	12¾	15¾	18¼
	Sidewalls T_3	6	6	6	6	6	6	6	6	6	6½	7	7	7½	8½	8	9	10	6	6	6	6½	7	7	7	7	7½	8	8	9	10	8	8	9	10	9	9	10½	12
Steel	a — Size: Bar #	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	6	7	7	6	7	7	6	7	7	6	7	8	7	6	7	8	7	6	7	8	7	6	7	8
	Spacing	10½	13	10	10¼	13	10	10½	13	10	10	11	10¼	13	10	11	10¼	13	11	12	11	11	12	11	11	12	11	11	12	10¼	11	11	12	10¼	11	11	12	10¼	11	11¼
	Length	32-0	32-0	32-0	32-0	32-0	32-0	32-0	32-0	32-0	33-0	33-2	33-2	33-4	33-8	33-6	33-6	33-4	34-8	39-1	38-6	39-0	39-3	39-1	38-10	39-5	39-5	39-3	39-6	40-1	40-0	40-2	39-9	39-6	40-1	41-0	40-1	40-1	40-2	40-7	41-6
	b or b_1 — Size: Bar #	6	7	7	6	7	7	6	7	7	7	8	8	8	7	7	8	8	7	7	8	7	7	8	7	7	8	7	7	8	9	7	7	8	9	7	7	8	9	7	7	8	9
	Spacing	10½	13	10	10¼	13	10	10½	13	10	10	11	10¼	13	10	11	10¼	13	11	12	11	11	12	11	11	12	11	11	12	10¼	11	11	12	10¼	11	11	12	10¼	11	11¼
	Length "b"	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	32-10	33-0	32-10	32-11	33-4	33-11	33-8	33-8	33-5	34-10	38-7	38-9	38-9	39-3	38-7	38-9	39-5	39-5	39-3	39-6	40-2	40-0	40-3	39-9	39-6	40-2	41-0	39-7	39-10	40-3	41-0	41-6
	Length "b_1"	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	32-10	33-0	32-10	32-11	33-4	33-11	33-8	33-8	33-5	33-11	38-7	38-9	39-2	39-3	38-9	38-9	39-5	39-5	39-3	39-7	39-10	39-9	40-2	40-0	39-9	40-2	41-0	39-7	39-10	40-3	41-0	41-6
Reinforcing	c — Size: Bar #	5	7	7	5	7	7	5	7	7	5	7	7	8	5	7	7	8	6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6	7	8	9	6	7	8	9
	Spacing	10½	13	10	10¼	13	10	10½	13	10	10½	13	10	11	10½	13	10	11	12	11	11	12	11	11	12	11	11	12	10¼	11	11	12	10¼	11	11	12	10¼	11	11	11¼
	Length	21-0	21-0	21-0	21-0	21-0	21-0	21-0	21-0	21-1	21-2	21-2	21-3	21-5	21-4	21-5	21-6	21-8	25-0	25-0	25-1	25-0	25-0	25-2	25-8	25-8	25-3	25-4	25-4	25-6	25-4	25-8	25-4	25-6	25-8	25-8	25-9	25-6	25-8	25-8	25-9	26-0
	"d" Dist. Bars — Top Slab-Tot. No.	27	15	15	27	15	15	27	15	15	27	15	15	15	27	15	15	15	36	15	15	36	15	15	36	15	15	36	15	15	15	36	15	15	15	36	15	15	15	36	15	15	15
	Bottom Slab-Tot. No.	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	"e" Bars — Size: Bar #	4	4	5	4	5	6	4	6	7	4	6	7	8	5	6	8	8	4	4	6	4	4	6	4	4	6	4	6	7	8	5	7	8	8	6	7	9	9				
	Spacing	18	13	10	18	13	10	13	13	10	10½	12	10	11	10¼	9	10	9	18	7	11½	12	5¾	11½	12	5¾	9	10	10¼	11	11½	12	10¼	11	6¼	12	9	11	9				
	Spacers Number	68			68			72			76			94	102				76			80			84			104			110			116									
Quan.	Concrete: C.Y. per lin. ft.	1.98	2.40	2.82	2.06	2.48	2.90	2.13	2.55	3.03	2.34	2.77	3.23	3.78	2.68	3.18	3.73	4.22	2.60	3.18	3.82	2.70	3.26	3.96	2.88	3.45	4.13	3.13	3.79	4.61	5.45	3.23	3.93	4.72	5.65	3.62	4.28	5.24	6.18				
	Reinf. : Lbs per lin. ft.	358	372	470	359	379	482	367	391	502	377	402	514	590	421	453	577	632	489	505	628	497	516	637	505	527	654	536	582	719	872	548	606	745	939	575	636	793	963				

Note:
For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities. Number of "d" bars in table is slab total for all three cells.

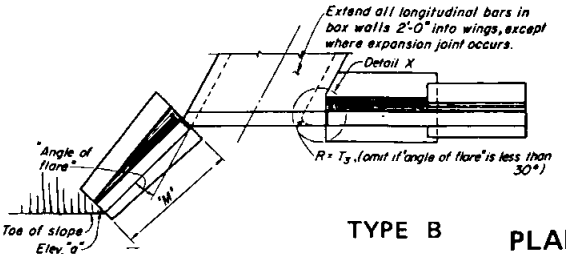
⊛ For reinforcement clearance, except at bottom, see "Miscellaneous Details."



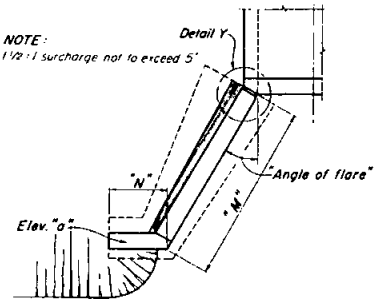
"FLAT INVERT" ALTERNATIVE
(When shown)



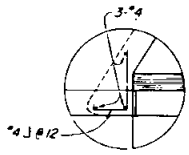
TYPICAL SECTION



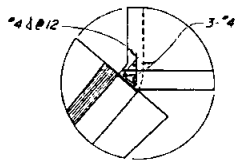
TYPE A TYPE B PLAN



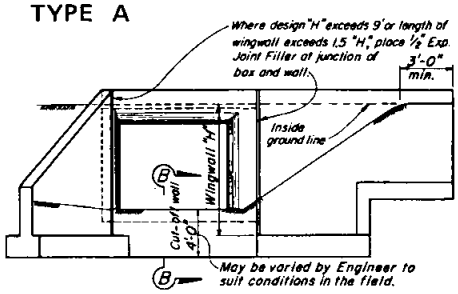
TYPE C



DETAIL X

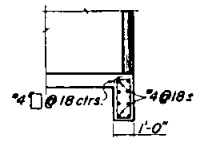


DETAIL Y

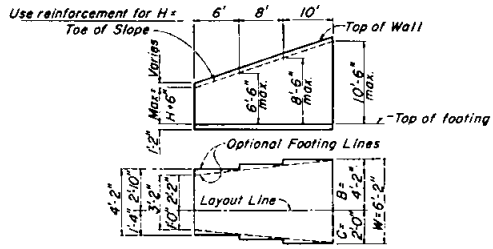


TYPE A TYPE B

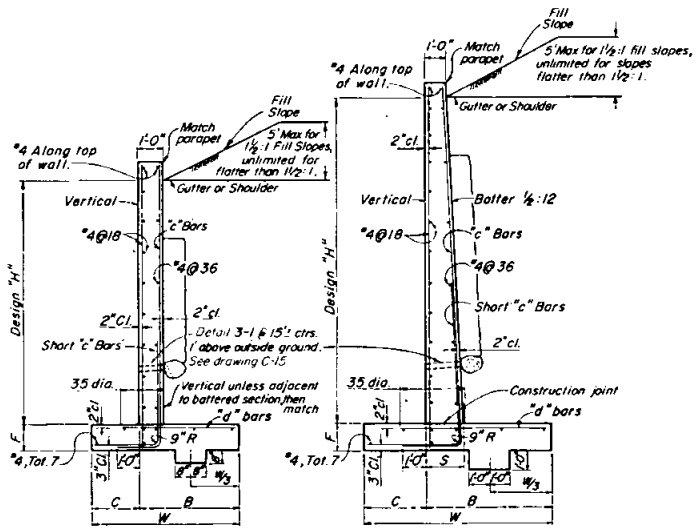
END ELEVATION
STRAIGHT WINGWALLS



SECTION B–B

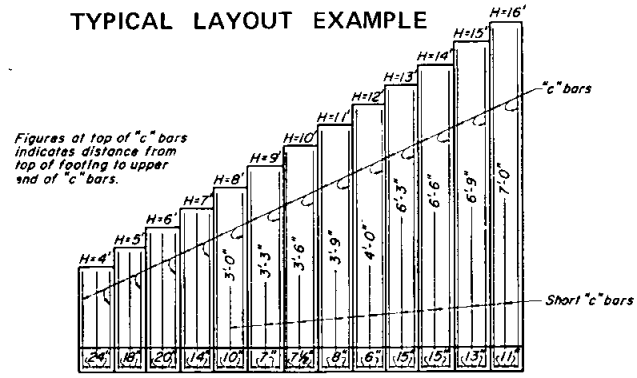


TYPICAL LAYOUT EXAMPLE



TYPICAL SECTION
H = 4' thru 12'

TYPICAL SECTION
H = 13' thru 16'



REINFORCED CONCRETE WINGWALLS													
"H"	4'	5'	6'	7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
W	3'-2"	3'-8"	4'-2"	4'-8"	5'-2"	5'-8"	6'-2"	6'-8"	7'-2"	7'-8"	8'-2"	8'-8"	9'-2"
C	1'-0"	1'-2"	1'-4"	1'-6"	1'-8"	1'-10"	2'-0"	2'-2"	2'-4"	2'-6"	2'-8"	2'-10"	3'-0"
B	2'-2"	2'-6"	2'-10"	3'-2"	3'-6"	3'-10"	4'-2"	4'-6"	4'-10"	5'-2"	5'-6"	5'-10"	6'-2"
F	1'-2"												
Batter	None											½:12	
S	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-0"	1'-6½"	1'-7"	1'-7½"	1'-8"
"c" Bars	#4@24	#4@18	#5@20	#5@14	#5@10	#5@7	#6@7½	#7@8	#7@6	#9@15	#9@15	#10@13	#10@11
"d" Bars	#4@24	#4@18	#5@20	#5@14	#5@10	#5@14	#7@15	#8@16	#7@12	#8@15	#9@15	#9@13	#9@11
Conc. C.Y./L.F.	0.32	0.38	0.44	0.49	0.55	0.61	0.67	0.73	0.79	1.02	1.10	1.18	1.26
Reinf. Lbs./L.F.	13	16	19	25	30	37	49	62	76	73	90	104	125

Quantities do not include that portion above the design "H" limit.

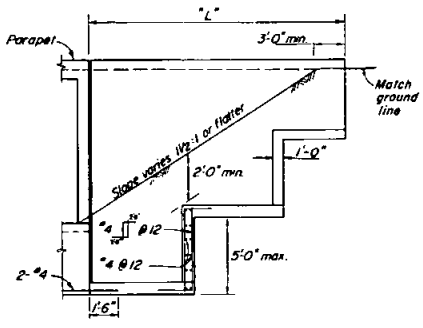
NOTES

Unit Stresses: $f_s = 20{,}000$ p.s.i, $f_c = 1200$ p.s.i, n=10

Maximum Toe Pressure = 1½ Tons/sq. ft.

Elevations, length and angle of flare of wings may be varied by the Engineer to suit conditions encountered in the field. Walls designed for 2' livelood surcharge, 1½:1 sloping surcharge not to exceed 5' in elevation plus 2' livelood surcharge, or unlimited 2:1 surcharge.

Dimensions "H," "L," "M" "N," Elev. "a" and "Angle of flare" (as apply) are shown on the plans.



ELEVATION

Revision	By	Approved	Date

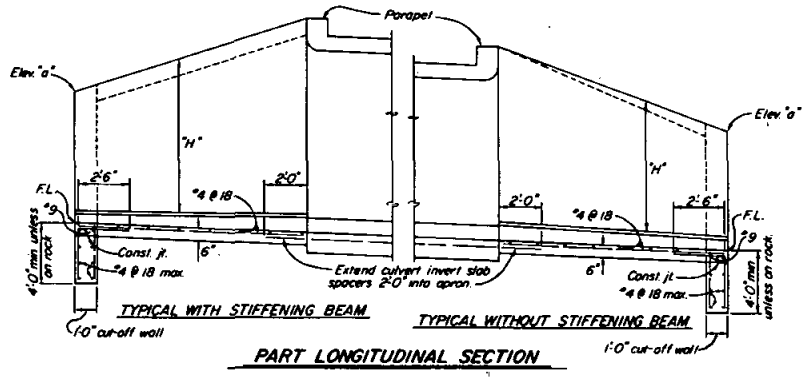
SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WINGWALL TYPES A, B & C

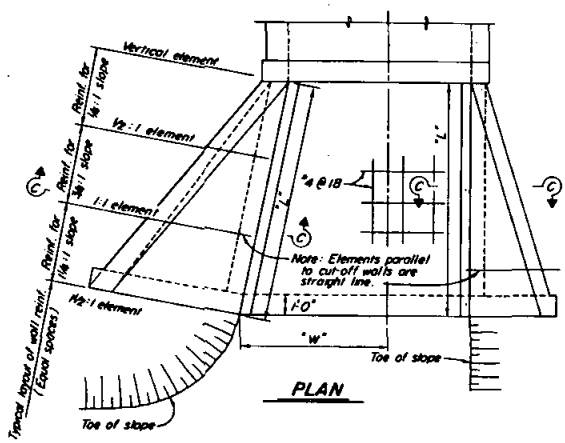
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A. Kercheval — Dec. 1975
Coordinator R.C.E. 19807 — Date

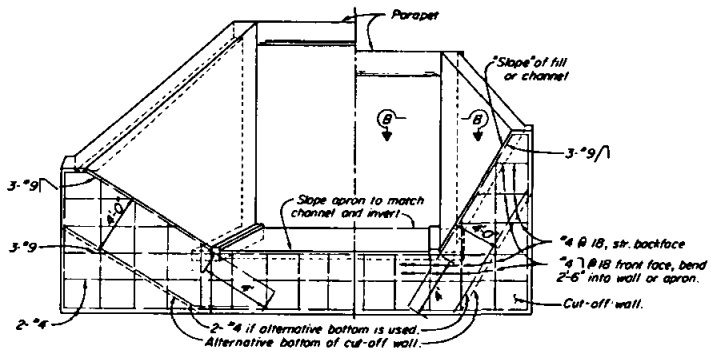
DRAWING NUMBER D-79



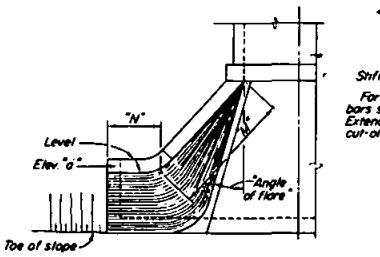
PART LONGITUDINAL SECTION



PLAN

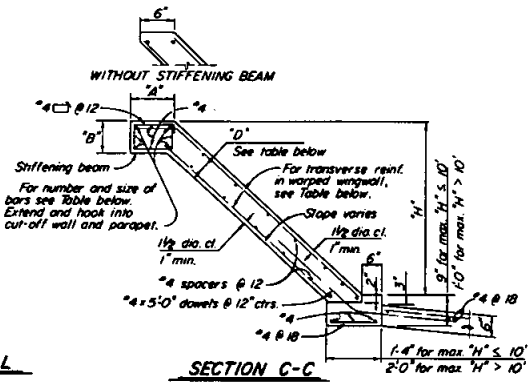


END ELEVATION



ALTERNATIVE WARPED WINGWALL

Use where additional protection to toe of embankment is required.

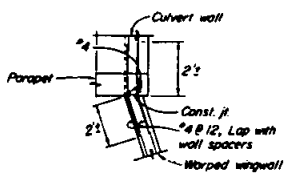


SECTION C-C

WARPED WINGWALLS

Element Slope	"H"	WALL DIMENSIONS AND REINFORCING: 8' or less	10'	12'	14'	16'	18'	20'
½:1	Front face reinf.	#4 @ 12	#4 @ 7	#5 @ 7	#5 @ 5	#6 @ 6	#7 @ 7	#7 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
¾:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 8	#4 @ 6
	Rear face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 10	#4 @ 7	#4 @ 6	#5 @ 8
1½:1	Front face reinf.	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12	#4 @ 12
	Rear face reinf.	#4 @ 8	#4 @ 8	#4 @ 5	#5 @ 6	#6 @ 7	#6 @ 6	#7 @ 6
"D" at Cut-off Wall		6"	6"	6"	7½"	8"	9½"	11"
"D" at Culvert		6"	6"	6"	8"	9½"	11"	1'-1"

STIFFENING BEAM DIMENSIONS AND REINFORCING: "A"	12'	14'	16'	18'	20'	25'	30'	35'	40' or more
6" core	No beam. Place 2'-6" in each face along top of wall								
8"	"A" = 1'-0" "B" = 9" Tot. 6'-6"								
10"						"A" = 1'-6" "B" = 1'-0" Tot. 6'-7"	"A" = 1'-10" "B" = 1'-0" Tot. 6'-8"	"A" = 2'-0" "B" = 1'-6" Tot. 8'-9"	
12"									
14"									
16"									
18"									
20"									



SECTION B-B

Notes : Walls designed for 2' surcharge; earth load = 120 #/cu. ft.; equivalent fluid pressure = 36 #/cu ft.
Vary "D" of warped wall uniformly from that at cut-off wall to that at culvert, for max. "H" > 12'.
Where abrasion is anticipated increase apron thickness, to 7" min. to provide 2" min. reinforcement coverage.
Dimensions "L", "W", "H", "M", "N", Elev. "a", "Angle of flare", and end "Slope" (as apply) are shown on the plans.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kershaw — Coordinator R.C.E. 19807

Dec. 1975 — Date

DRAWING NUMBER **D-80**

SAN DIEGO REGIONAL STANDARD DRAWING

BOX CULVERT WARPED WINGWALLS

Revision	By	Approved	Date

DESIGN NOTES

SPECIFICATIONS:

DESIGN: A A S H.O. DATED 1973 WITH REVISIONS AND AS SUPPLEMENTED BY STATE OF CALIFORNIA BRIDGE PLANNING AND DESIGN MANUAL.

SECTIONS DESIGNED FOR CULVERT IN A TRENCH ON HARD FOUNDATION, OR CULVERT UNTRENCHED ON YIELDING FOUNDATION. FOR CULVERTS ON PILES OR ROCK FOUNDATIONS, SPECIAL DESIGN WILL BE REQUIRED

LOADING:

LIVE LOAD: FOR LEGAL HIGHWAY LOADS, USE HS20-44 OR ALTERNATIVE, WITH 30% IMPACT FOR ALL COVER DEPTHS NO IMPACT ON INVERT.

COVER LESS THAN 2'- WHEEL LOAD DISTRIBUTION ON THE TOP SLAB IS E=0.1755+3.2' LONGITUDINALLY AND CONCENTRATED ALONG THE SPAN. WHEEL LOAD DISTRIBUTION ON THE INVERT SLAB IS 7.5' LONGITUDINALLY AND UNIFORMLY OVER THE BREATH OF THE CULVERT

COVER 2' OR MORE - WHEEL LOADS DISTRIBUTED UNIFORMLY OVER A SQUARE, THE SIDES OF WHICH ARE 1.75 TIMES THE DEPTH OF COVER, BUT NOT LESS LONGITUDINALLY THAN E ON THE TOP SLAB, OR 7.5 ON THE INVERT SLAB. WHEN SUCH AREAS FROM SEVERAL WHEEL CONCENTRATIONS OVERLAP, THE TOTAL LOAD SHALL BE CONSIDERED AS UNIFORMLY DISTRIBUTED OVER THE AREA DEFINED BY THE OUTSIDE LIMITS OF THE INDIVIDUAL AREAS, BUT THE OVERALL LONGITUDINAL DIMENSION SHALL NOT EXCEED THE TOTAL LENGTH OF THE SUPPORTING SLAB. NEGLECT LIVE LOAD, ON SINGLE SPANS WHEN COVER IS MORE THAN 8' AND EXCEEDS SPAN, AND ON MULTIPLE SPANS WHEN COVER EXCEEDS DISTANCE BETWEEN EXTERIOR WALLS.

DEAD LOAD: EARTH LOAD OF 120 PCF AND AN EQUIVALENT FLUID PRESSURE OF 36 PCF, REDUCED TO 84 PCF AND 25 PCF RESPECTIVELY FOR CLEAR SPANS OF 20' OR LESS.

UNIT STRESSES: F_s = 20,000 P.S.I., N=10

F_c = 1,200 P.S.I.

REINFORCEMENT EMBEDMENT IS 1½ DIA. CLEAR, MIN 1" AND IN ¼" INCREMENTS, EXCEPT AS NOTED

DISTRIBUTION "d" BARS EXPRESSED AS A % OF MAIN POSITIVE REINFORCEMENT:

CLASSIFICATION "A": TOP SLAB = $\frac{100}{\sqrt{\text{SPAN}}}$, MAX. 50% (UNLESS TRAFFIC LONGITUDINAL)

BOTTOM SLAB = #4 @ 18" MAX

CLASSIFICATION "B" TO "E": TOP AND BOTTOM SLABS #4 @ 18" MAX.

GENERAL NOTES

QUANTITIES: QUANTITIES ARE FOR THE SLOPED INVERT SLAB AND DO NOT INCLUDE SPLICES IN LONGITUDINAL BARS, NOR TEMPERATURE REINFORCEMENT FOR EXPOSED TOP CULVERT, NOR CONCRETE OR REINFORCEMENT FOR PARAPETS OR CUTOFF WALLS.

SPECIAL COVERAGE: BOX STANDARD PLANS ARE NOT TO BE USED FOR CULVERTS IN A CORROSIVE ENVIRONMENT OR WHERE THERE IS A SEVERE ABRASIVE FLOW CONDITION.

DESIGNATION: SHOW ON PLANS AS SPAN X HEIGHT – STRENGTH CLASSIFICATION X LENGTH THUS 4 x 4 - A x 60', FOLLOWED BY ALTERNATIVES

ALTERNATIVES: INVERT WILL BE SLOPED UNLESS "TRAPEZOIDAL INVERT", "FLAT INVERT" OR "V INVERT" IS INCLUDED IN DESIGNATION. ENDS OF CULVERT WILL BE ROUNDED UNLESS "SQUARE ENDS" ARE DESIGNATED PARAPETS WILL BE AS SHOWN UNLESS "— FT. PARAPET" IS DESIGNATED IN PLANS. SUCH DESIGNATIONS MAY BE DIFFERENT FOR INLET AND OUTLET ENDS.

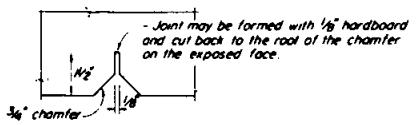
REINF. PLACEMENT: MAIN REINFORCEMENT IS POSITIONED TRANSVERSE OR, FOR CURVED CULVERTS, RADIAL, WHEN RADIAL, REINFORCING SPACING IS MEASURED ALONG THE ℄.

CONSTRUCTION NOTES

EXPANSION JOINTS: BOTTOM SLAB – NO EXPANSION JOINTS SHALL BE PLACED
TOP SLAB AND WALLS – WHEN COVER IS LESS THAN SPAN LENGTH, PLACE ½" EXPANSION JOINT FILLER AT 30'± CENTERS OUTSIDE THE PAVED ROADWAY LANES AND PLACE BRIDGE DETAIL 3-2 AT 30'± CENTERS UNDER PAVED ROADWAY LANES.
WHEN COVER IS MORE THAN SPAN LENGTH, PLACE ½" EXPANSION JOINT FILLER AT 30'± CENTERS AND ADDITIONAL ½" EXPANSION JOINTS AT LOCATIONS OF CHANGE IN FOUNDATION CHARACTER, AS DIRECTED BY THE ENGINEER.

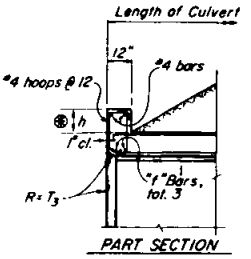
CONSTRUCTION LOADS:
NOT PERMITTED UNTIL CONCRETE HAS REACHED A STRENGTH OF 3,000 P.S.I. OR AGE OF 28 DAYS, WHICHEVER OCCURS FIRST, AND FALSEWORK PLANS HAVE BEEN SUBMITTED BY THE CONTRACTOR TO THE ENGINEER, AND APPROVED

CONSTRUCTION JOINTS:
TEMPORARY JOINTS MAY BE PERMITTED IF NORMAL (OR RADIAL) TO ℄ OF RCB. OTHERWISE, THE CONTRACTOR IS TO SUBMIT A PROPOSAL FOR CONSIDERATION.



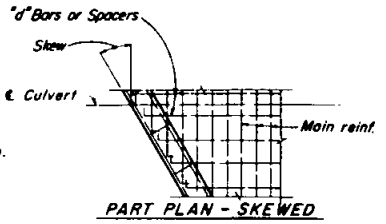
BRIDGE DETAIL 3-2
(Portion)

See Standard Drawing C-15



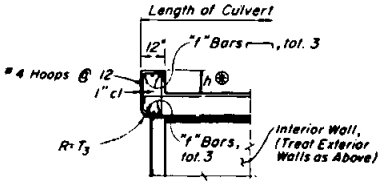
PART SECTION

h = S', 6" min.

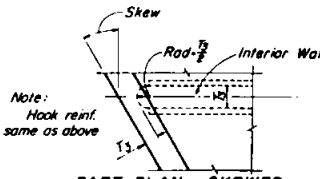


PART PLAN - SKEWED

PARAPET DETAILS FOR SINGLE SPAN CULVERTS



PART SECTION

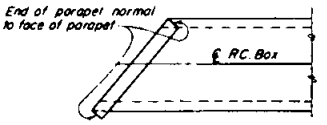


PART PLAN - SKEWED

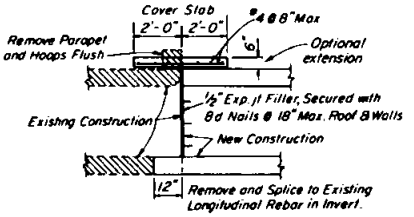
PARAPET DETAILS FOR MULTIPLE SPAN CULVERTS

PARAPET "f" BAR NOS.

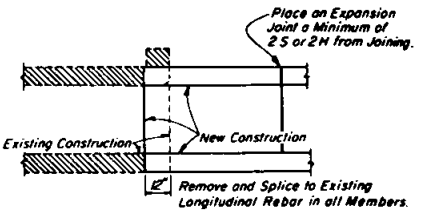
SPAN \ SKEW ANGLE	0° TO 15°	16° TO 30°	31° TO 45°
4'	#4	#4	#4
6'	#4	#4	#5
8'	#4	#5	#6
10'	#5	#6	#7
12'	#6	#7	#8
14'	#7	#8	#9



PARAPET DETAIL FOR SKEWED CULVERTS W/O WINGWALLS



COVER: 1' AND GREATER



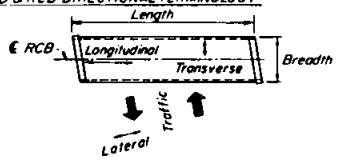
COVER: EXPOSED TOP AND GREATER

CULVERT EXTENSION
20° SKEW MAXIMUM

USE OF STANDARD DRAWING

"STRENGTH CLASSIFICATION", SYMBOLIZED BY THE LETTERS "A", "B", "C" ETC., AT THE TOP OF THE DATA TABLE IS MERELY A CONVENIENT DESIGNATION FOR A PARTICULAR STRUCTURAL SECTION FOR A CULVERT OF ANY GIVEN OPENING. IT IS DICTATED BY THE COVER OR DEPTH OF FILL OVER THE TOP SLAB.

LIVE LOAD & RCB DIRECTIONAL TERMINOLOGY



Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

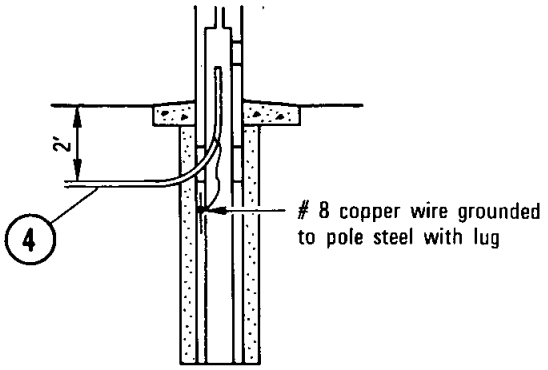
BOX CULVERT MISCELLANEOUS DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

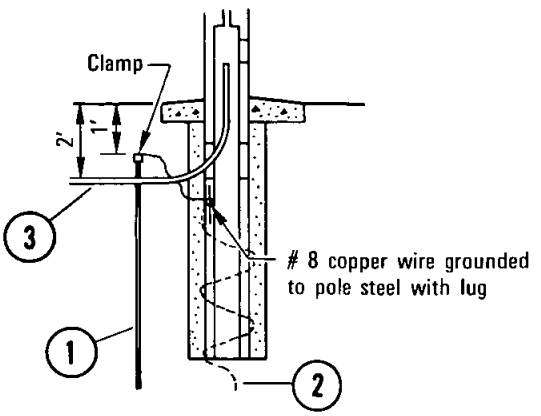
Allan A Kaucheval — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **D-81**

ELECTRICAL SYSTEMS

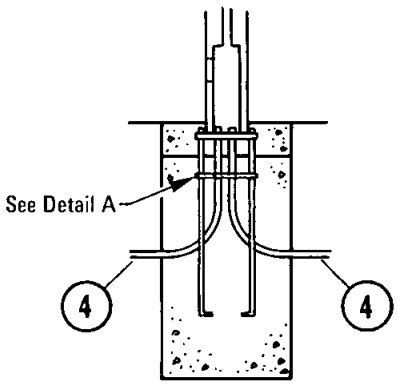


STEEL CONDUIT

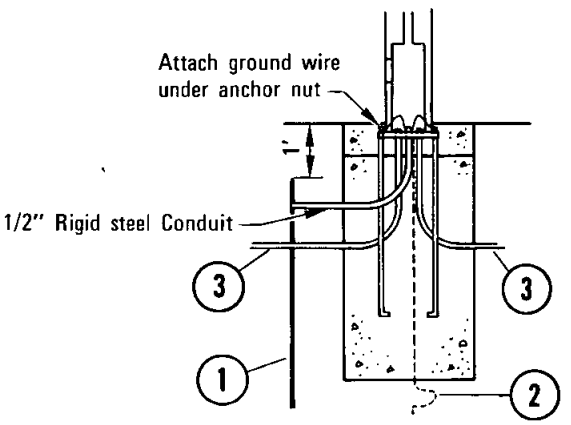


NON–METALLIC CONDUIT

DIRECT BURIAL FOUNDATION



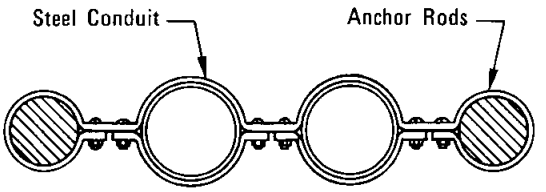
STEEL CONDUIT



NON–METALLIC CONDUIT

ANCHOR BASE FOUNDATION

1. 3/4"x 8' copper covered steel ground rod.
2. Alternate Ground: 15' no. 4 bare stranded copper wire, coiled.
3. Approved non-metallic conduit.
4. Steel conduit.



DETAIL A

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel Dec. 1975

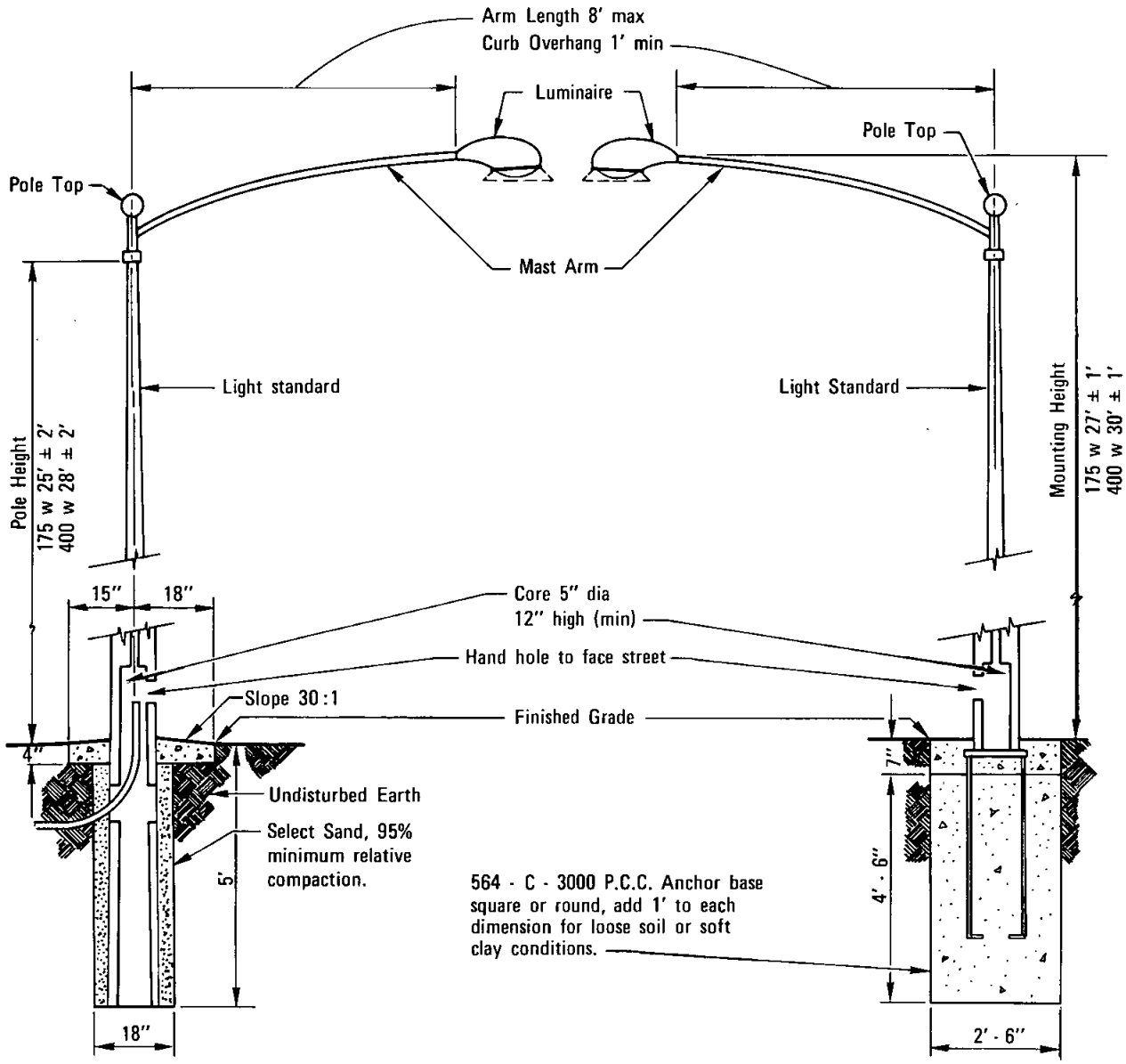
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **E-2**

SAN DIEGO REGIONAL STANDARD DRAWING

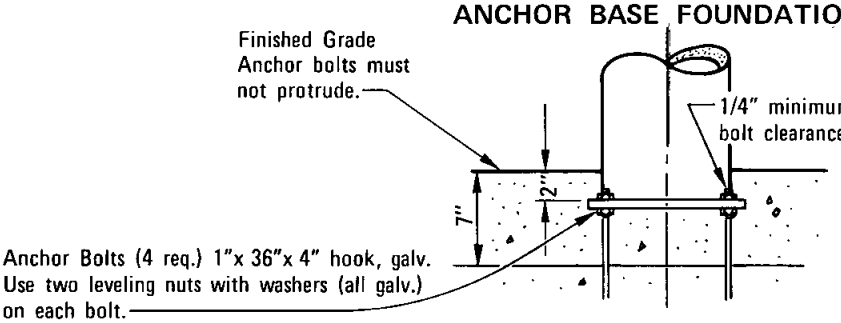
GROUNDING OF CONCRETE LIGHTING STANDARDS

Revision	By	Approved	Date



DIRECT BURIAL FOUNDATION

ANCHOR BASE FOUNDATION



Revision	By	Approved	Date

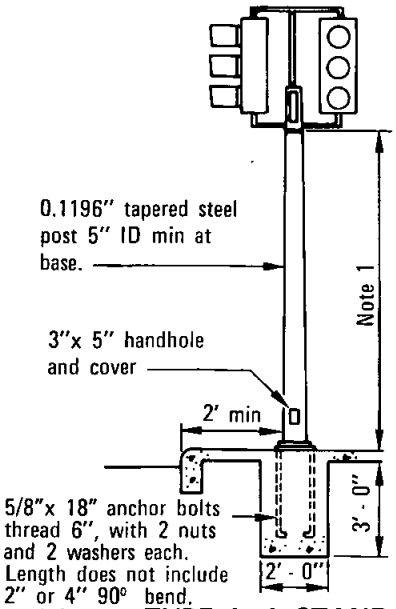
SAN DIEGO REGIONAL STANDARD DRAWING

ORNAMENTAL STREET LIGHT

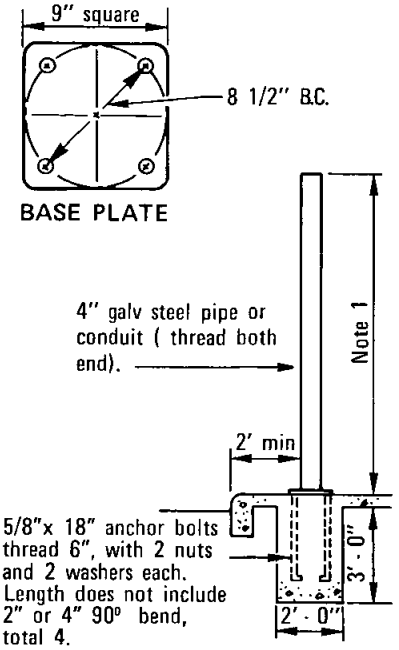
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

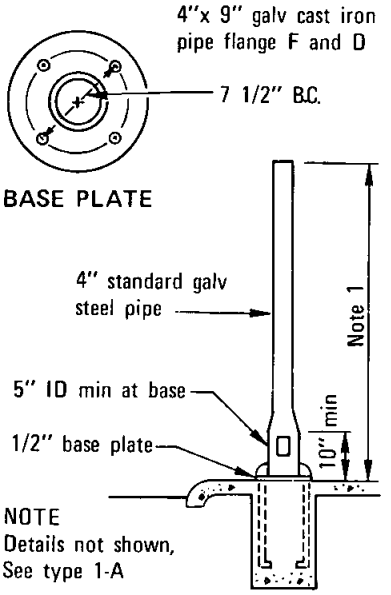
DRAWING NUMBER **E-1**



TYPE 1–A STANDARD

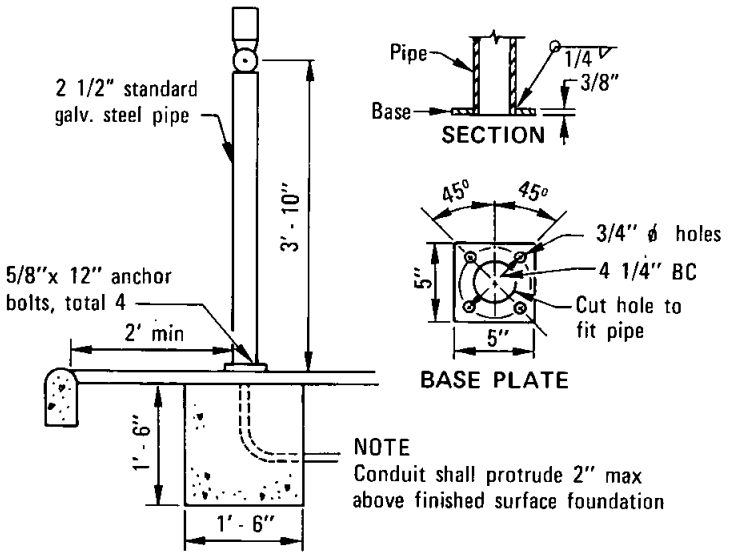


TYPE 1–B STANDARD



TYPE 1–C STANDARD

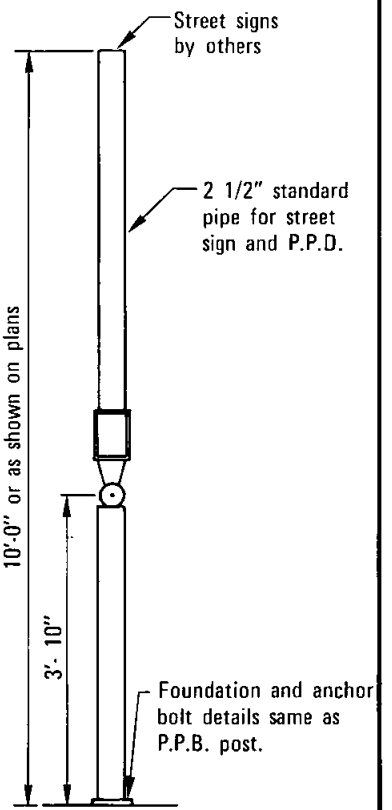
TYPE 1 SIGNAL STANDARDS



ELEVATION

BASE PLATE

PEDESTRIAN PUSH BUTTON POST



COMBINED STREET SIGN
PEDESTRIAN PUSH BOTTON POST

NOTES

1. Standards shall be 10' - 0" ± 2" for vehicular signals and 7' - 0" ± 2" for pedestrian signals unless otherwise noted on plans.
2. Top of Standards shall be 4 1/2" OD.
3. Conduits shall extend 2" max above finished surface of foundation and for Type 1-A and 1-C Standards shall be sloped toward handhole.
4. Anchor Bolts shall be bonded to conduit.
5. Conduit between standard and adjacent pull box shall be 2" size min.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

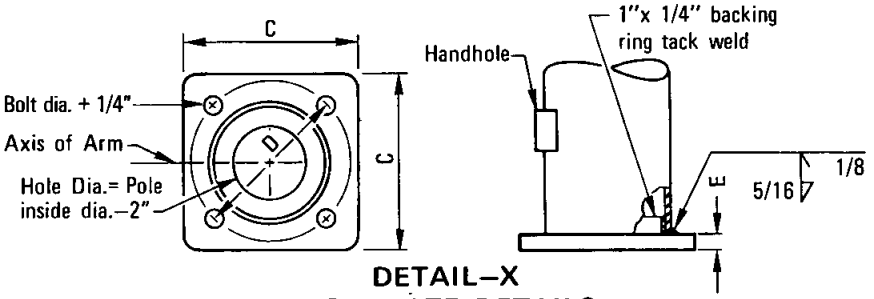
TRAFFIC SIGNAL STANDARD - TYPE 1 & PUSHBUTTON POSTS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

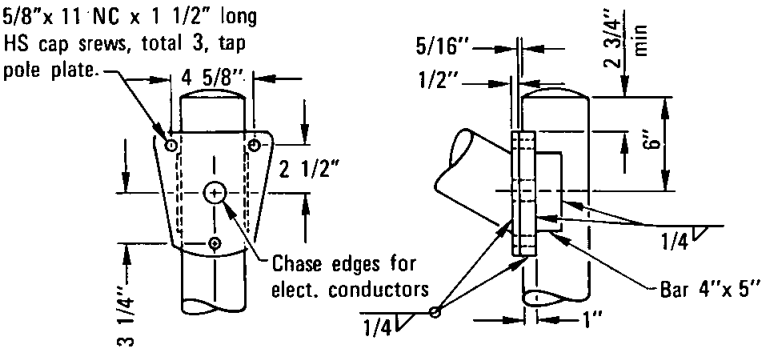
Allan A. Kenkel — Dec. 1975

Coordinator R.C.E. 19807 — Date

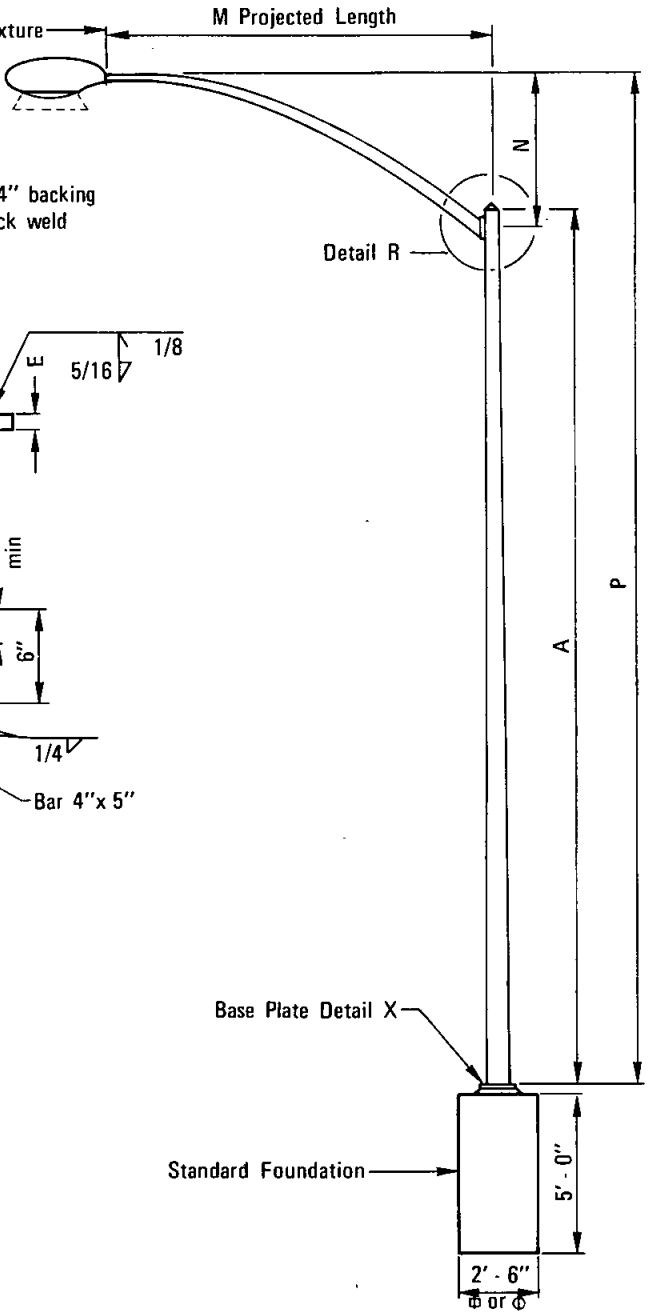
DRAWING NUMBER **E-3**



DETAIL–X
BASE PLATE DETAILS



DETAIL–R
LUMINAIRE ARM CONNECTION



LUMINAIRE ARM DATA				
M Projected Length	N Rise	Min OD At Pole	Thick-ness	P Mounting Height
6' - 0"	2' - 0" ±	3 1/4"	0.1345"	30' - 0" ±
8' - 0"	2' - 6" ±	3 1/2"	0.1345"	30' - 6" ±
10' - 0"	3' - 3" ±	3 7/8"	0.1345"	31' - 3" ±
12' - 0"	4' - 3" ±	3 7/8"	0.1345"	32' - 3" ±
15' - 0"	4' - 9" ±	4 1/4"	0.1345"	32' - 9" ±

Pole Type	POLE DATA				BASE PLATE DATA				Luminaire Arm
	A Height	Min OD Base	Min OD Top	Thickness	C	D B.C.	E	Anchor Bolts	
15	28' - 6"	7 3/4"	3 7/8"	0.1345"	11 1/2"	11"	1"	1"x 36"x 4" or 1"x 34"x6"	6'–15'

NOTES

1. See Standard Drawing E-5 for Slip Base Insert.
2. See Standard Drawing E-17 for foundation details.
3. Luminaire arm projected length to be 12' unless otherwise shown on plans.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

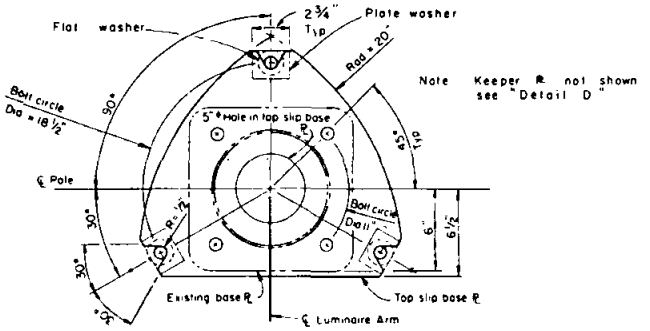
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER E-4

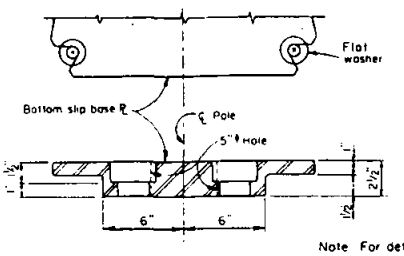
SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL & STREET LIGHTING STANDARD--TYPE 15

Revision	By	Approved	Date

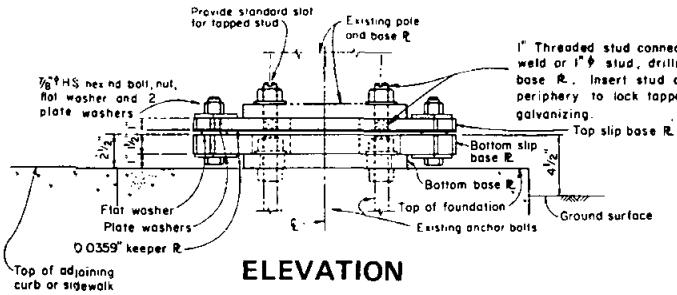


PLAN–TOP PLATES

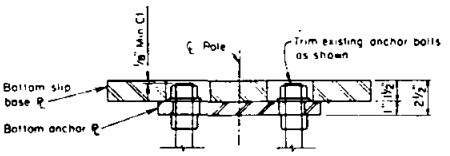


SECTION C–C
CAST OPTION

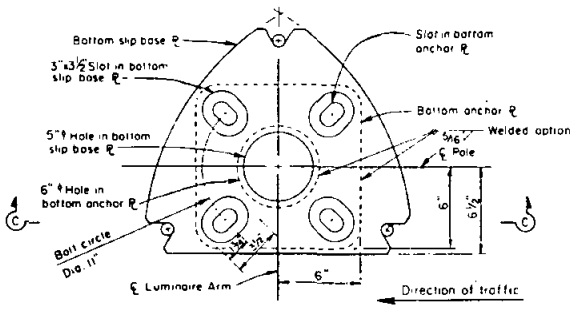
Note For details not shown see "Bottom Anchor ℄ Details" and "Plan - Bottom Plates"



ELEVATION

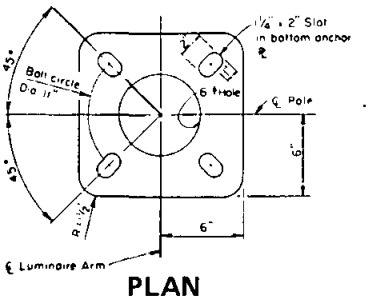


SECTION C–C
WELDED OPTION



PLAN–BOTTOM PLATES

Note: For Plate dimensions see "Plan - Top Plates"



PLAN

SLIP BASE PLATE INSERT DETAILS

BOTTOM ANCHOR PLATE DETAILS

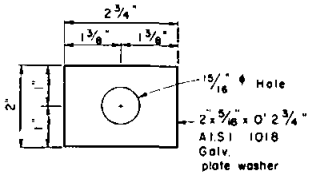
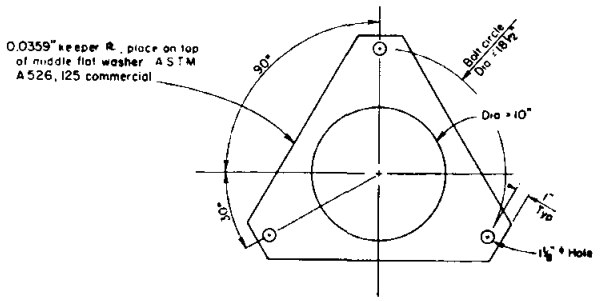


PLATE WASHER



DETAIL–D

NOTES

1. All new material shall be galvanized after fabrication.
2. The 7/8" HS slip base bolts shall be torqued to the following values:

Front Bolts	84 foot-pounds
Rear Bolt	110 foot-pounds

3. All slots shall be filled with mastic.
4. *Plates shall conform to ASTM A-36, except as noted.*
5. Cast option shall conform to ASTM A-27 Grade 70-40.
6. Flat washer shall conform to ASTM A-325.

Revision	By	Approved	Date

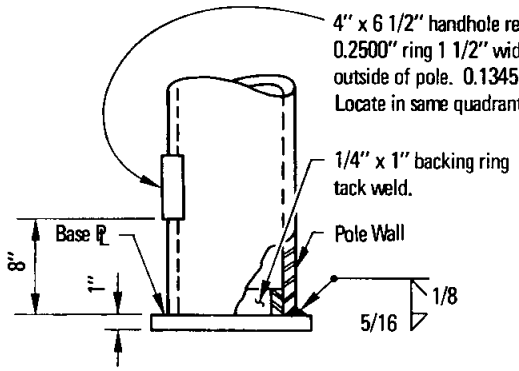
SAN DIEGO REGIONAL STANDARD DRAWING

SLIP BASE INSERT FOR TYPE 15 TRAFFIC SIGNAL & STREET LIGHTING STANDARD

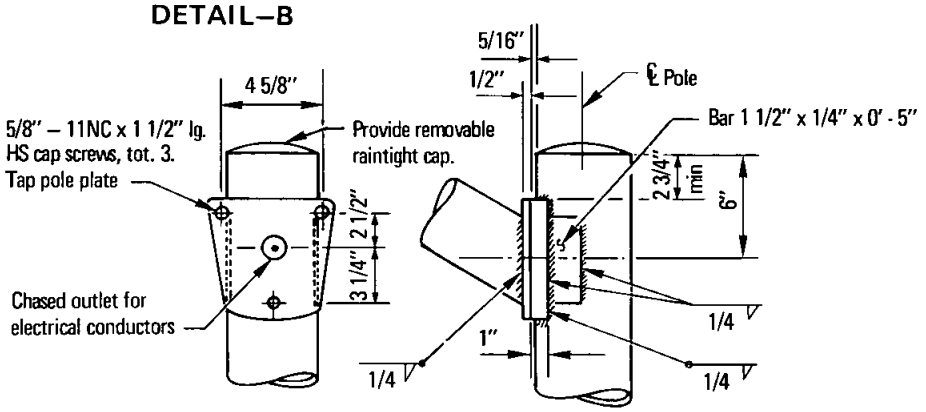
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A Kercheval — Dec. 1975
Coordinator R.C.E. 19807 — Date

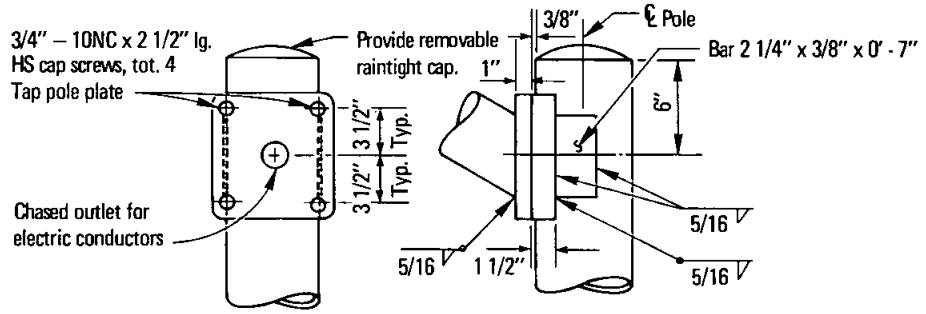
DRAWING NUMBER **E-5**



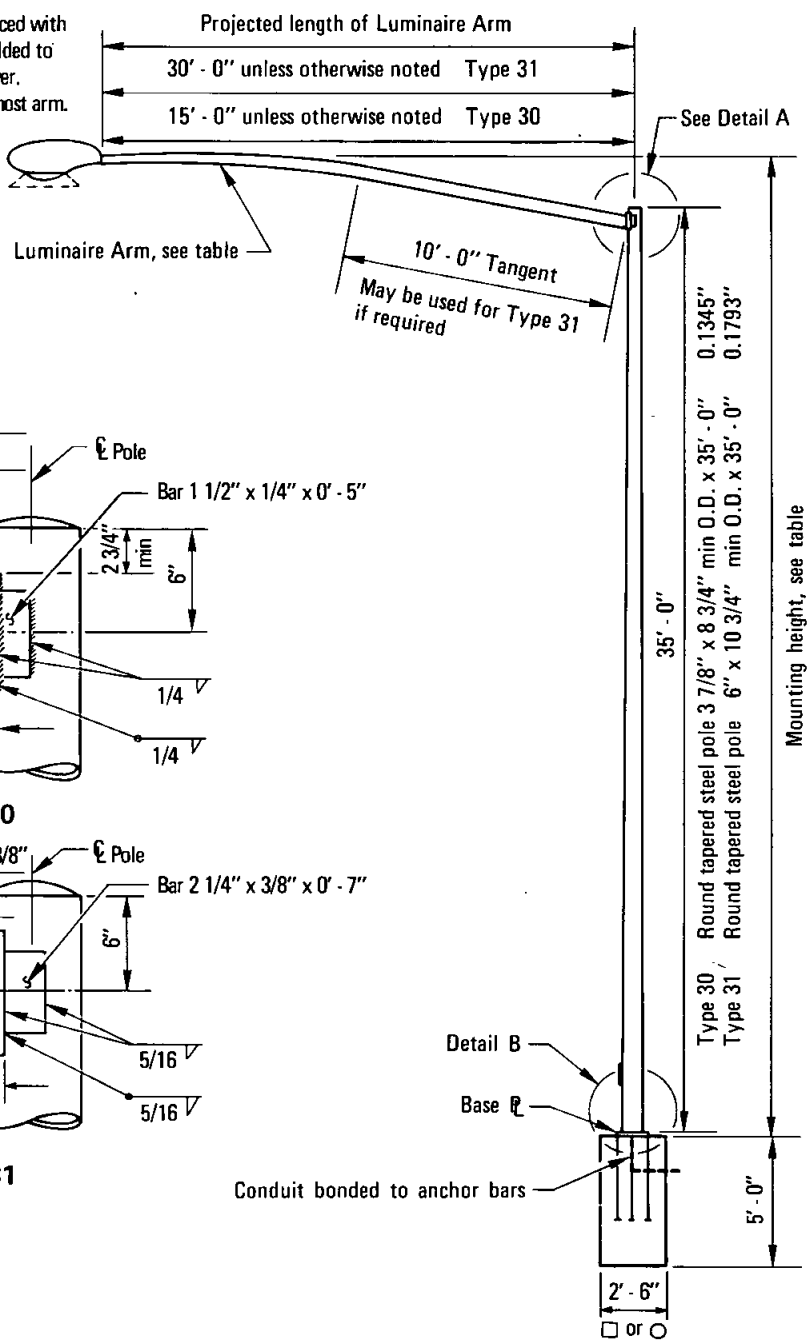
DETAIL–B



DETAIL A–TYPE 30



DETAIL A–TYPE 31



Luminaire Arm Data				
	Projected Length	Thickness	Minimum O.D. @ Pole	Mounting Height
*	6' - 0"	0.1345"	3 1/4"	36' - 9" ±
	8' - 0"	0.1345"	3 1/2"	37' - 3" ±
	10' - 0"	0.1345"	3 3/4"	38' - 0" ±
	12' - 0"	0.1345"	3 3/4"	39' - 0" ±
	15' - 0"	0.1345"	4 1/4"	39' - 6" ±
* *	20' - 0"	0.1793"	5"	37' - 0" ±
	25' - 0"	0.1793"	5 3/4"	38' - 6" ±
	30' - 0"	0.1793"	6 1/2"	40' - 0" ±

* Type 30 - Arm Length 6' – 15' max.

* * Type 31 - Arm Length 20' – 30'

NOTES

1. Sheet and plate thickness shown is nominal thickness.
2. For details not shown, see Standard Drawing E-17
3. Plates shall conform to ASTM A-36, except as noted.
4. In lieu of the torque requirements for HS bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from snug tight condition. No washer will be required.
5. See Standard Drawing E-7 for base plate details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kershaw Dec. 1975

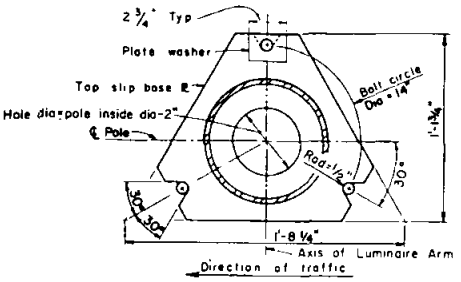
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

STREET LIGHTING STANDARDS TYPES 30 AND 31

DRAWING NUMBER E-6

Revision	By	Approved	Date



PLAN–TYPICAL BASE PLATE

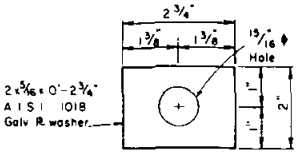
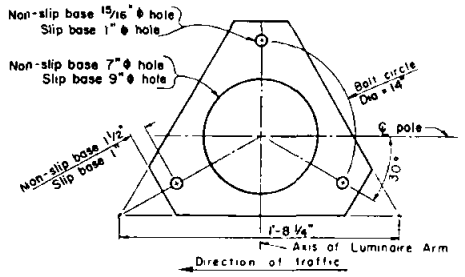
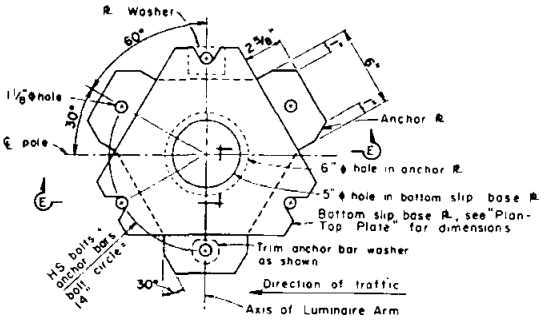


PLATE WASHER

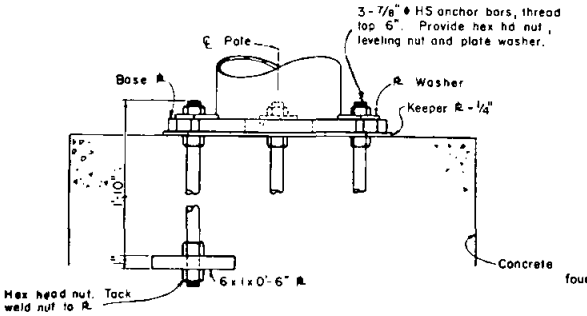


KEEPER PLATE

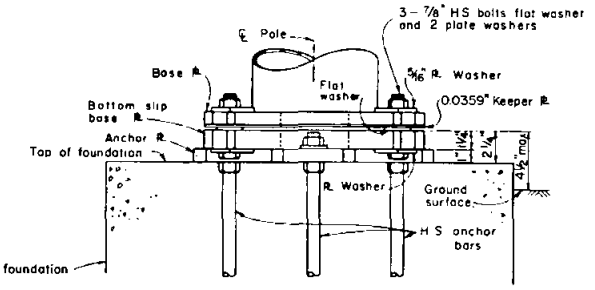


PLAN BOTTOM PLATES

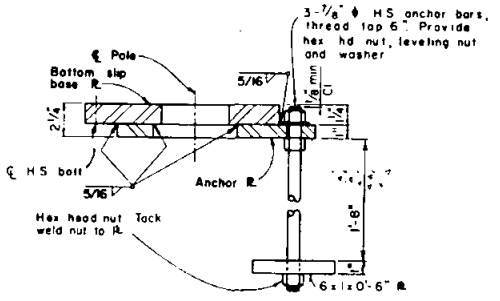
SLIP BASE PLATE DETAILS



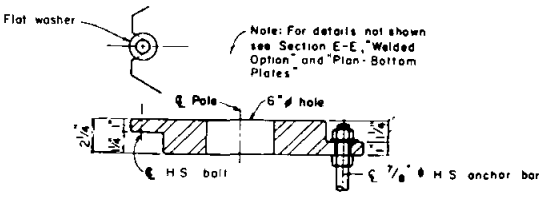
ELEVATION NON–SLIP BASE



ELEVATION SLIP BASE



WELDED OPTION



CAST OPTION

SECTION E–E

NOTES

1. Cast option shall conform to ASTM A-27, Grade 70-40.
2. The 7/8" HS slip base bolts shall be torqued to the following values: Front Bolts–84 foot-pounds; Rear Bolt–110 foot-pounds.
3. 7/8" HS anchor bars, wrench tignten, torque requirements waived.
4. HS bolts, flat washers and nuts and washers for HS anchor bars shall conform to ASTM A-325.
5. A slip base is to be furnished unless the plans or special provisions specify a non-slip base.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

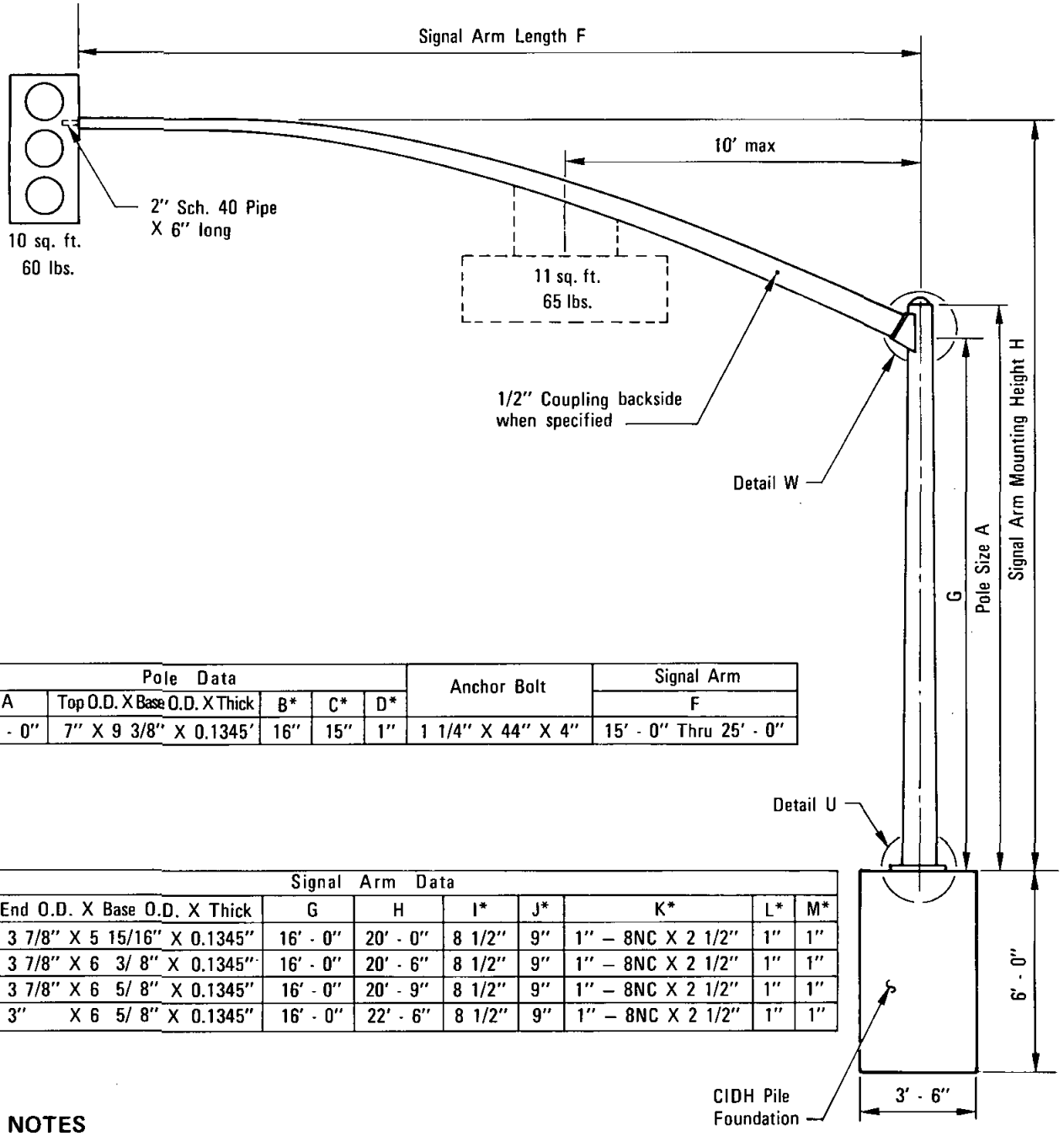
BASE PLATE DETAILS TYPES 30 AND 31 STREET LIGHTING STANDARDS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel Dec. 1975

Coordinator R.C.E. 19807 Date

DRAWING NUMBER E-7



Pole Type	Pole Data					Anchor Bolt	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		F
100	17' - 0"	7" X 9 3/8" X 0.1345'	16"	15"	1"	1 1/4" X 44" X 4"	15' - 0" Thru 25' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I*	J*	K*	L*	M*
15' - 0"	3 7/8" X 5 15/16" X 0.1345"	16' - 0"	20' - 0"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"
18' - 0"	3 7/8" X 6 3/ 8" X 0.1345"	16' - 0"	20' - 6"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"
20' - 0"	3 7/8" X 6 5/ 8" X 0.1345"	16' - 0"	20' - 9"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"
25' - 0"	3" X 6 5/ 8" X 0.1345"	16' - 0"	22' - 6"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimension shown on details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER E-8

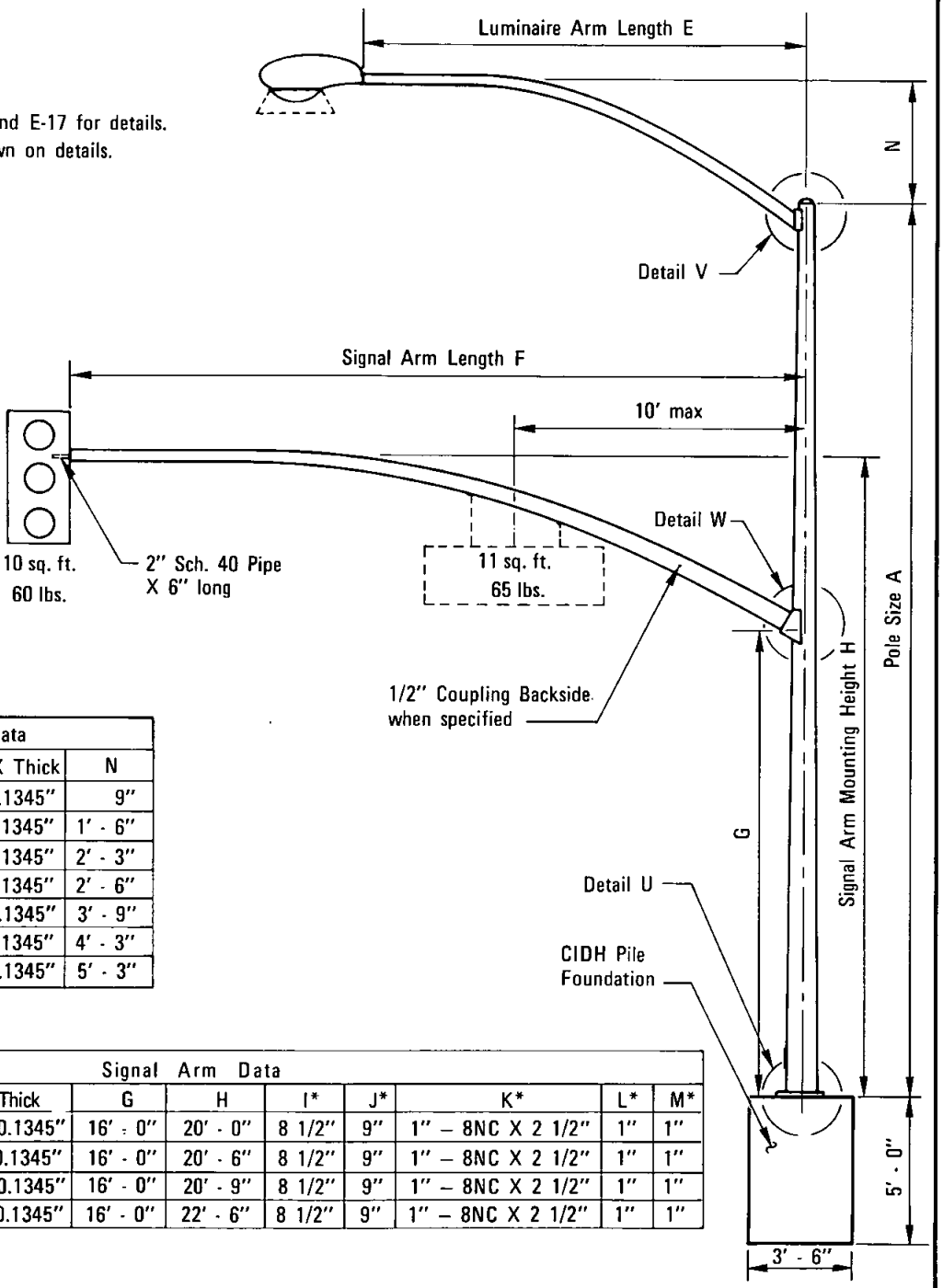
SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL STANDARD TYPE 100

Revision	By	Approved	Date

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimension shown on details.



Luminaire Arm Data		
E	End O.D. X Base O.D. X Thick	N
4' - 0"	2 3/8" X 3" X 0.1345"	9"
6' - 0"	2 3/8" X 3 3/8" X 0.1345"	1' - 6"
8' - 0"	2 3/8" X 3 11/16" X 0.1345"	2' - 3"
10' - 0"	2 3/8" X 3 7/8" X 0.1345"	2' - 6"
12' - 0"	2 3/8" X 4 5/16" X 0.1345"	3' - 9"
15' - 0"	2 3/8" X 4 3/4" X 0.1345"	4' - 3"
18' - 0"	2 3/8" X 4 3/4" X 0.1345"	5' - 3"

Signal Arm Data								
F	End O.D. X Base O. D. X Thick	G	H	I*	J*	K*	L*	M*
15' - 0"	3 7/8" X 5 15/16" X 0.1345"	16' - 0"	20' - 0"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"
18' - 0"	3 7/8" X 6 3/ 8" X 0.1345"	16' - 0"	20' - 6"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"
20' - 0"	3 7/8" X 6 5/ 8" X 0.1345"	16' - 0"	20' - 9"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"
25' - 0"	3" X 6 5 / 8" X 0.1345"	16' - 0"	22' - 6"	8 1/2"	9"	1" – 8NC X 2 1/2"	1"	1"

Pole Type	Pole Data					Anchor Bolt	Luminaire Arm	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		E	F
101	30' - 0"	5 1/4" X 9 3/8" X 0.1345"	16"	15"	1"	1 1/4" X 44" X 4"	4' - 0" Thru 18' - 0"	15' - 0" Thru 25' - 0"
102	35' - 0"	4 1/2" X 9 3/8" X 0.1345"	16"	15"	1"	1 1/4" X 44" X 4"	4' - 0" Thru 18' - 0"	15' - 0" Thru 25' - 0"

Revision	By	Approved	Date

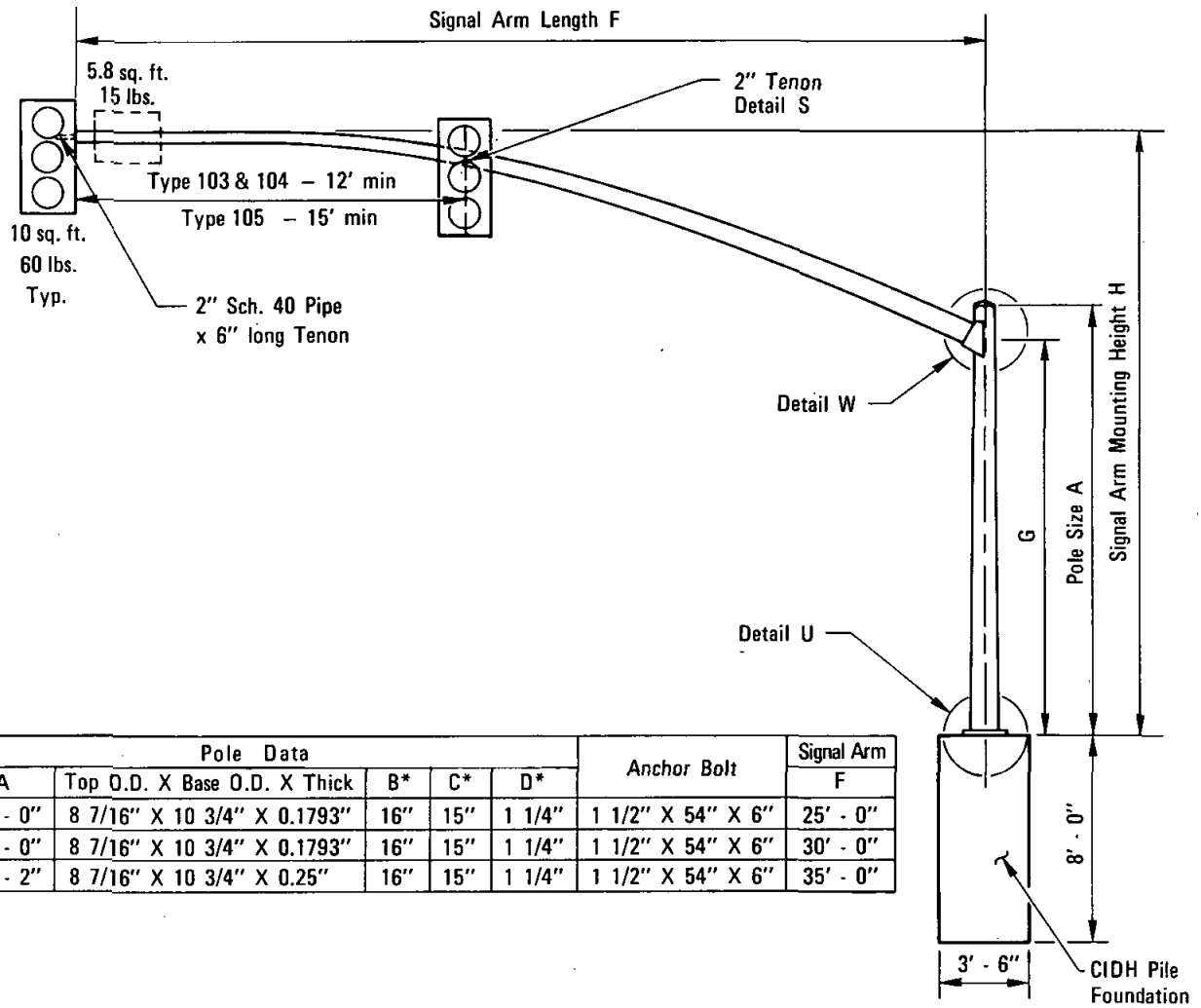
SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL AND STREET LIGHTING STANDARDS - TYPES 101 AND 102

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER **E-9**



Pole Type	Pole Data					Anchor Bolt	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		F
103	17' - 0"	8 7/16" X 10 3/4" X 0.1793"	16"	15"	1 1/4"	1 1/2" X 54" X 6"	25' - 0"
104	17' - 0"	8 7/16" X 10 3/4" X 0.1793"	16"	15"	1 1/4"	1 1/2" X 54" X 6"	30' - 0"
105	16' - 2"	8 7/16" X 10 3/4" X 0.25"	16"	15"	1 1/4"	1 1/2" X 54" X 6"	35' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I*	J*	K*	L*	M*
25' - 0"	3 7/8" X 7 5/16" X 0.1793"	16' - 0"	22' - 6"	10 1/2"	11"	1"– 8NC X 2 1/2"	1"	1 1/4"
30' - 0"	3 7/8" X 8" X 0.1793"	16' - 0"	23' - 0"	10 1/2"	11"	1"– 8NC X 2 1/2"	1"	1 1/4"
35' - 0"	3 7/8" X 8 11/16" X 0.1793"	15' - 2"	23' - 0"	12"	12"	1 1/4"–7NC X 3"	1 1/4"	1 1/2"

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimension shown on details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER E-10

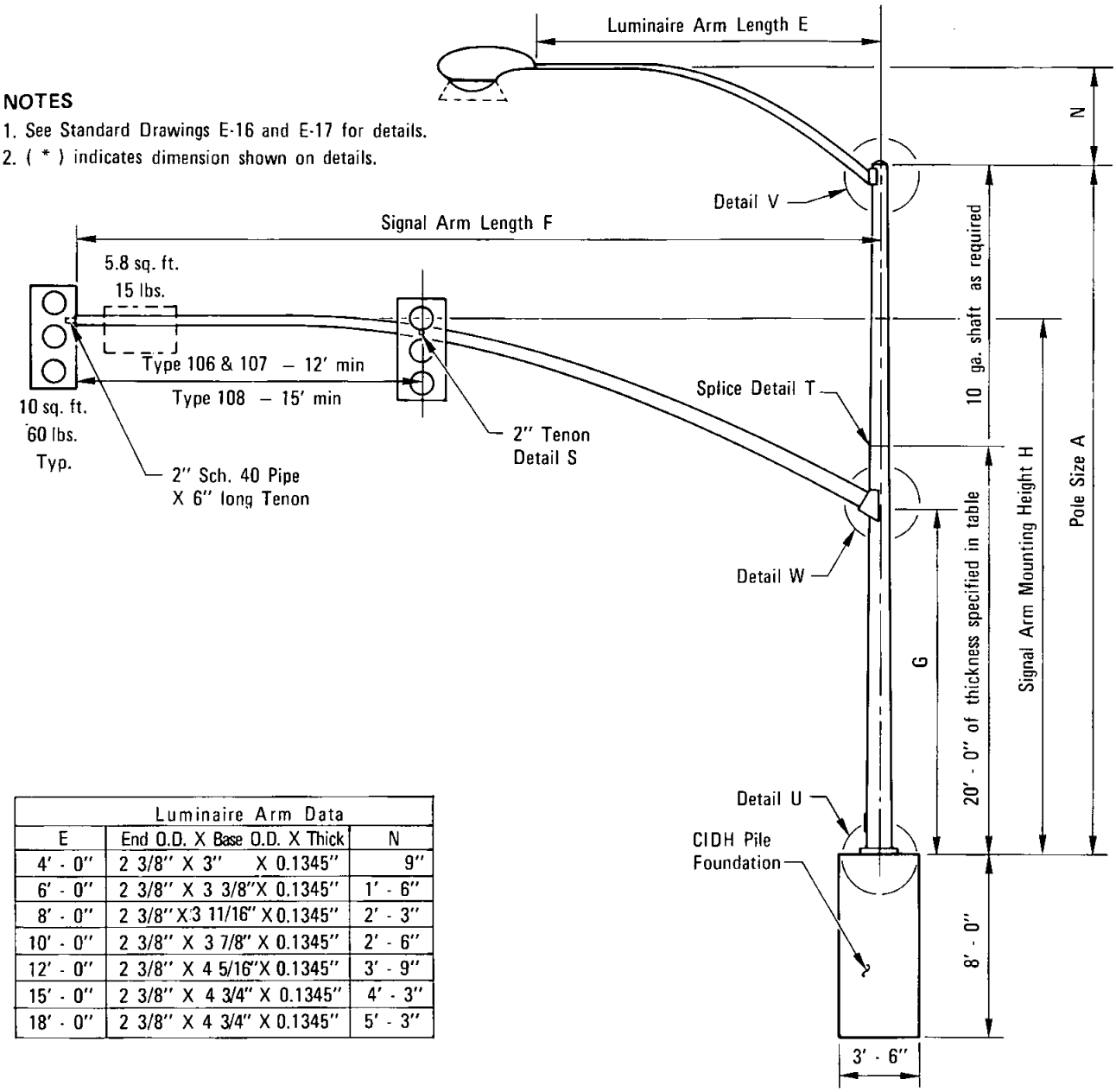
SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL STANDARDS TYPES 103, 104 AND 105

Revision	By	Approved	Date

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimension shown on details.



Luminaire Arm Data		
E	End O.D. X Base O.D. X Thick	N
4' - 0"	2 3/8" X 3" X 0.1345"	9"
6' - 0"	2 3/8" X 3 3/8" X 0.1345"	1' - 6"
8' - 0"	2 3/8" X 3 11/16" X 0.1345"	2' - 3"
10' - 0"	2 3/8" X 3 7/8" X 0.1345"	2' - 6"
12' - 0"	2 3/8" X 4 5/16" X 0.1345"	3' - 9"
15' - 0"	2 3/8" X 4 3/4" X 0.1345"	4' - 3"
18' - 0"	2 3/8" X 4 3/4" X 0.1345"	5' - 3"

Pole Type	Pole Data					Anchor Bolt	Luminaire Arm	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		E	F
106	30' - 0"	6 5/8" X 10 3/4" X 0.1793"	16"	15"	1 1/4"	1 1/2" X 54" X 6"	4' Thru 18'	25' - 0"
107	30' - 0"	6 5/8" X 10 3/4" X 0.1793"	16"	15"	1 1/4"	1 1/2" X 54" X 6"	4' Thru 18'	30' - 0"
108	30' - 0"	6 5/8" X 10 3/4" X 0.25"	16"	15"	1 1/4"	1 1/2" X 54" X 6"	4' Thru 18'	35' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I*	J*	K*	L*	M*
25' - 0"	3 7/8" X 7 5/16" X 0.1793"	16' - 0"	22' - 6"	10 1/2"	11"	1" – 8NC X 2 1/2"	1"	1 1/4"
30' - 0"	3 7/8" X 8" X 0.1793"	16' - 0"	23' - 0"	10 1/2"	11"	1" – 8NC X 2 1/2"	1"	1 1/4"
35' - 0"	3 7/8" X 8 11/16" X 0.1793"	15' - 2"	23' - 0"	12"	12"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

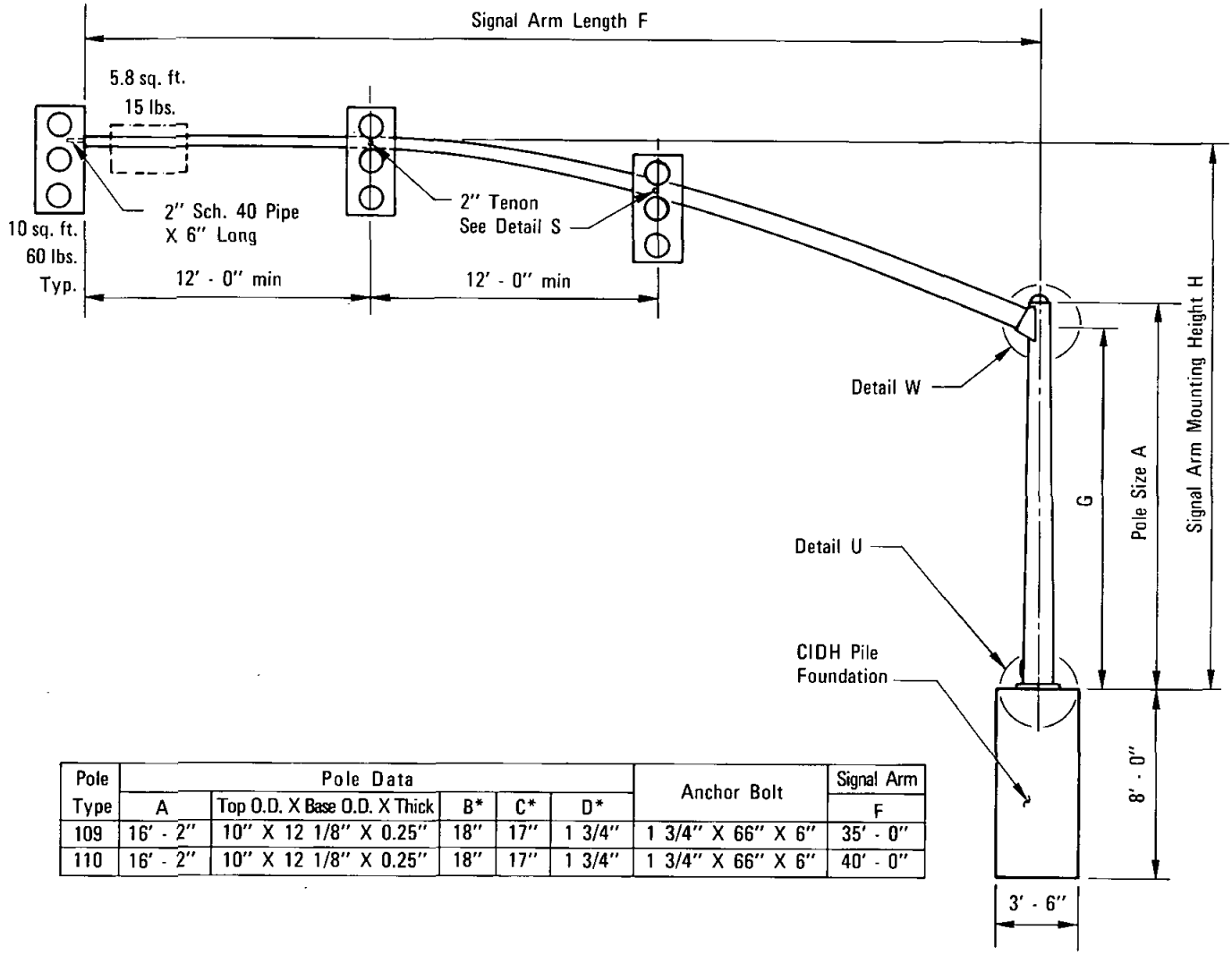
TRAFFIC SIGNAL AND STREET LIGHTING STANDARDS - TYPES 106, 107 AND 108

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel — Dec. 1975

Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **E-11**



Pole Type	Pole Data					Anchor Bolt	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		F
109	16' - 2"	10" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 66" X 6"	35' - 0"
110	16' - 2"	10" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 66" X 6"	40' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I*	J*	K*	L*	M*
35' - 0"	3 7/8" X 8 11/16" X 0.25"	15' - 2"	23' - 0"	12"	12"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"
40' - 0"	3 7/8" X 9 3/8" X 0.25"	15' - 2"	23' - 0"	12"	12"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimension shown on details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER E-12

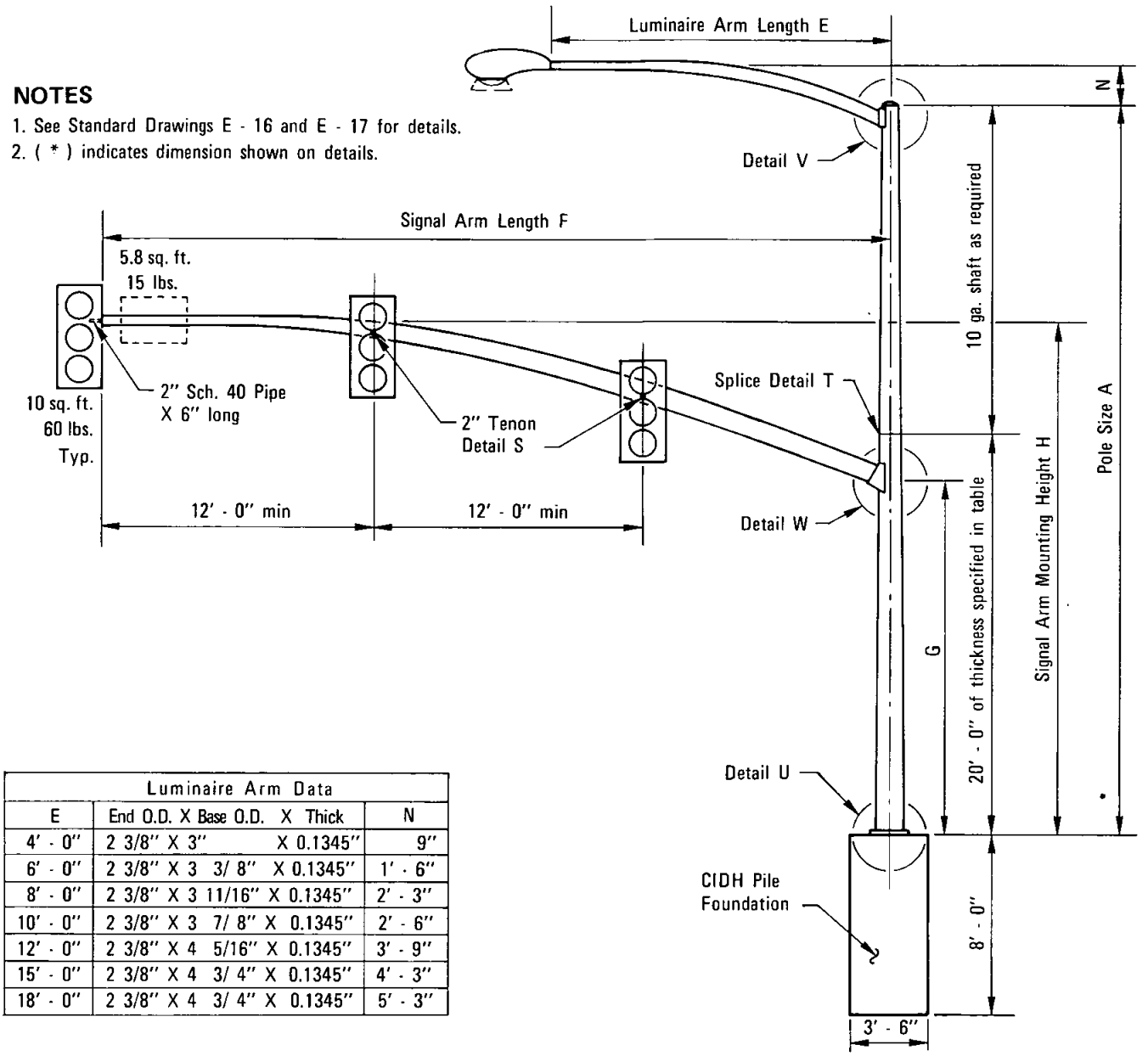
SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL STANDARDS TYPES 109 AND 110

Revision	By	Approved	Date

NOTES

1. See Standard Drawings E - 16 and E - 17 for details.
2. (*) indicates dimension shown on details.



Luminaire Arm Data		
E	End O.D. X Base O.D. X Thick	N
4' - 0"	2 3/8" X 3" X 0.1345"	9"
6' - 0"	2 3/8" X 3 3/ 8" X 0.1345"	1' - 6"
8' - 0"	2 3/8" X 3 11/16" X 0.1345"	2' - 3"
10' - 0"	2 3/8" X 3 7/ 8" X 0.1345"	2' - 6"
12' - 0"	2 3/8" X 4 5/16" X 0.1345"	3' - 9"
15' - 0"	2 3/8" X 4 3/ 4" X 0.1345"	4' - 3"
18' - 0"	2 3/8" X 4 3/ 4" X 0.1345"	5' - 3"

Pole Type	Pole Data					Anchor Bolt	Luminaire Arm	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		E	F
111	30' - 0"	8" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 66" X 6"	4' Thru 18'	35' - 0"
112	30' - 0"	8" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 66" X 6"	4' Thru 18'	40' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I*	J*	K*	L*	M*
35' - 0"	3 7/8" X 8 11/16" X 0.25"	15' - 2"	23' - 0"	12"	12"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"
40' - 0"	3 7/8" X 9 3/ 8" X 0.25"	15' - 2"	23' - 0"	12"	12"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"

Revision	By	Approved	Date

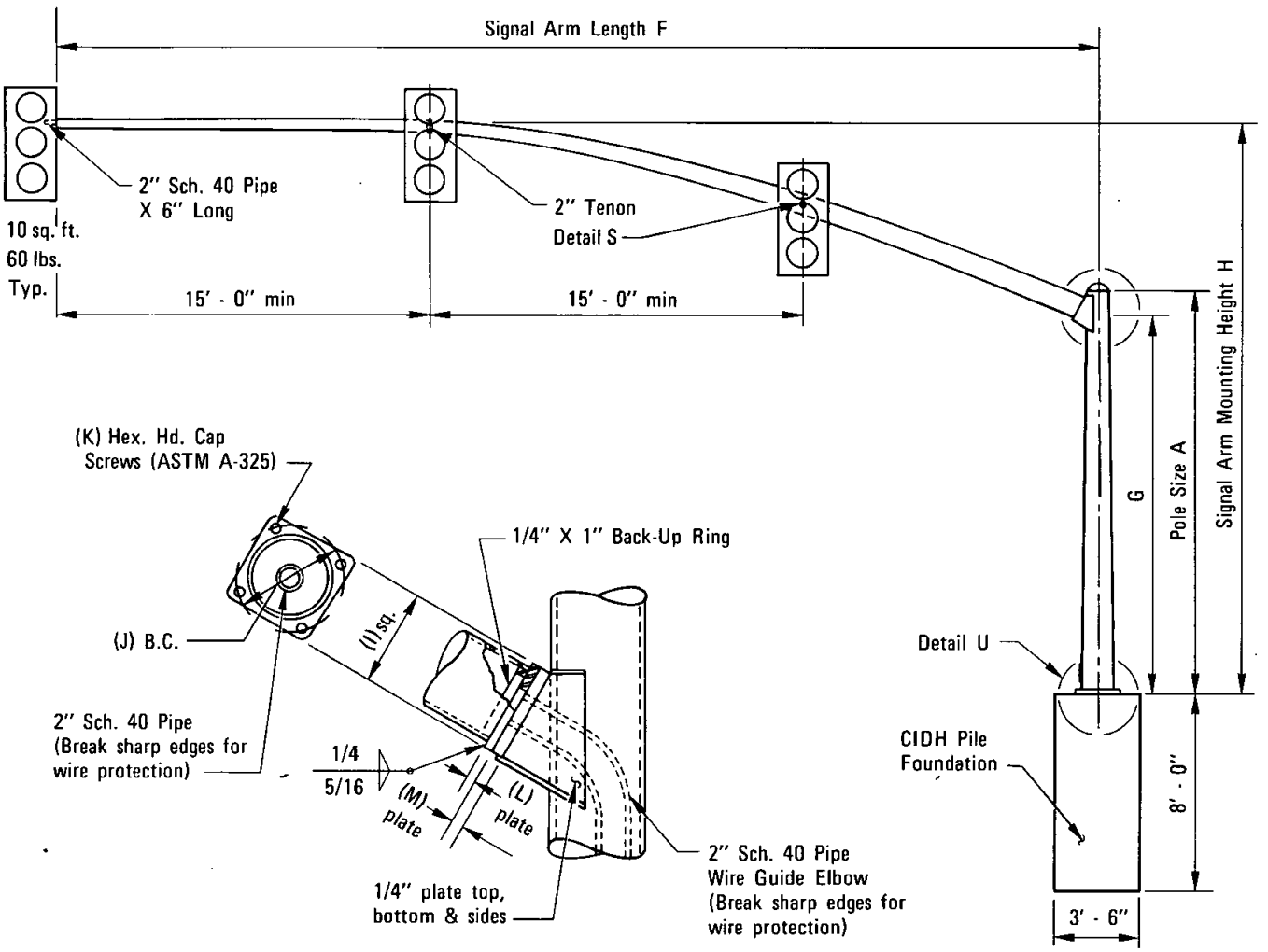
SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL AND STREET LIGHTING STANDARDS - TYPES 111 AND 112

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A Kercheval — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **E-13**



SIGNAL ARM CONNECTION

Pole Type	Pole Data					Anchor Bolt	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		F
113	16' - 2"	9 15/16" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 60" X 6"	45' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I	J	K	L	M
45' - 0"	3 7/8" X 10 1/16" X 0.25"	15' - 2"	22' - 6"	13"	13"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimensions shown on details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

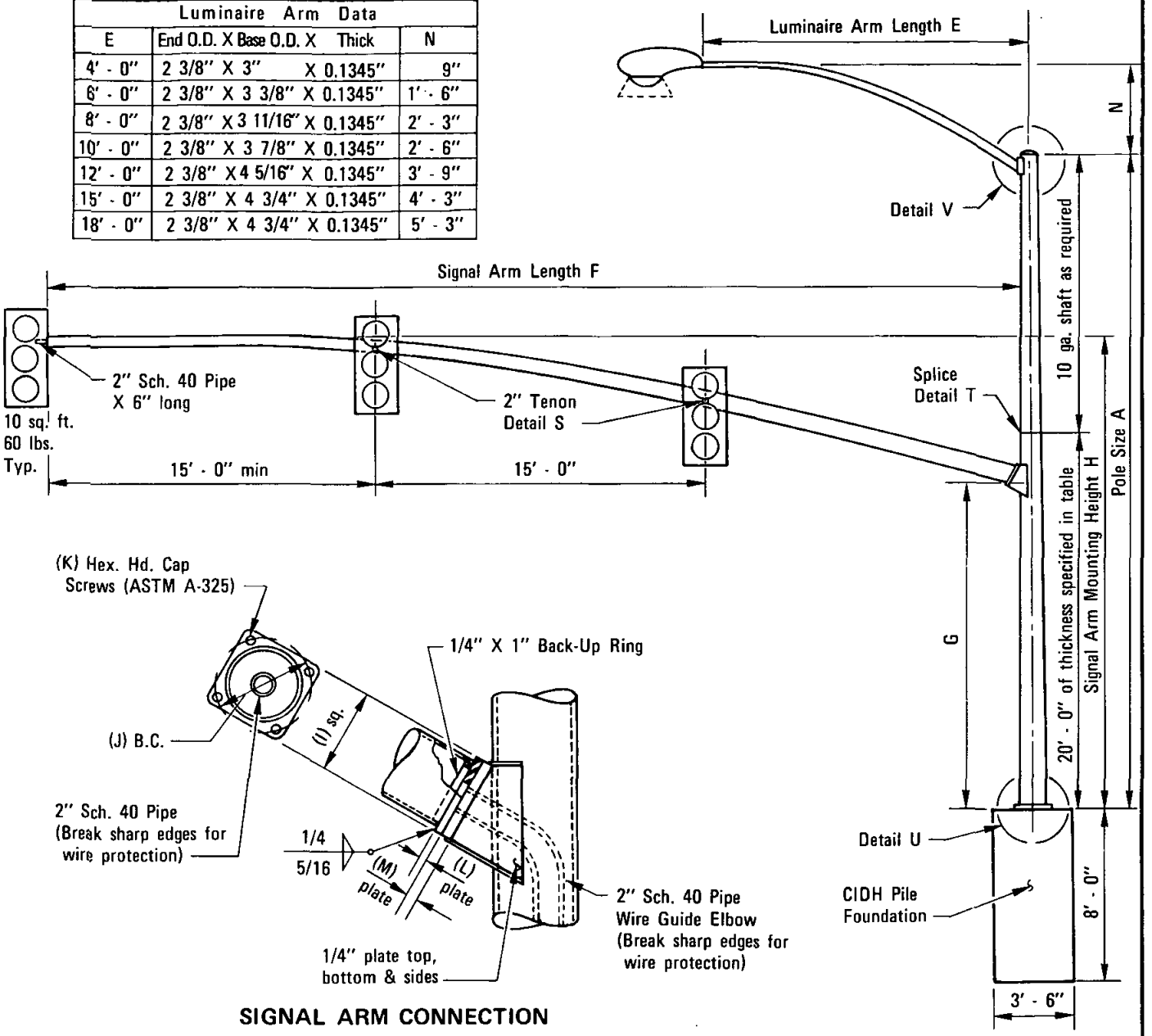
DRAWING NUMBER E-14

SAN DIEGO REGIONAL STANDARD DRAWING

TRAFFIC SIGNAL STANDARD
TYPE 113

Revision	By	Approved	Date

Luminaire Arm Data		
E	End O.D. X Base O.D. X Thick	N
4' - 0"	2 3/8" X 3" X 0.1345"	9"
6' - 0"	2 3/8" X 3 3/8" X 0.1345"	1' - 6"
8' - 0"	2 3/8" X 3 11/16" X 0.1345"	2' - 3"
10' - 0"	2 3/8" X 3 7/8" X 0.1345"	2' - 6"
12' - 0"	2 3/8" X 4 5/16" X 0.1345"	3' - 9"
15' - 0"	2 3/8" X 4 3/4" X 0.1345"	4' - 3"
18' - 0"	2 3/8" X 4 3/4" X 0.1345"	5' - 3"



SIGNAL ARM CONNECTION

Pole Type	Pole Data					Anchor Bolt	Luminaire Arm	Signal Arm
	A	Top O.D. X Base O.D. X Thick	B*	C*	D*		E	F
114	30' - 0"	8" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 60" X 6"	4' - 0" Thru 18' - 0"	45' - 0"
115	35' - 0"	7 1/8" X 12 1/8" X 0.25"	18"	17"	1 3/4"	1 3/4" X 60" X 6"	4' - 0" Thru 18' - 0"	45' - 0"

Signal Arm Data								
F	End O.D. X Base O.D. X Thick	G	H	I	J	K	L	M
45' - 0"	3 7/8" X 10 1/16" X 0.25"	15' - 2"	22' - 6"	13"	13"	1 1/4" – 7NC X 3"	1 1/4"	1 1/2"

NOTES

1. See Standard Drawings E-16 and E-17 for details.
2. (*) indicates dimension shown on details.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

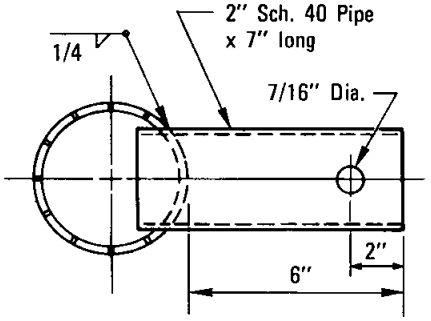
TRAFFIC SIGNAL AND STREET LIGHTING STANDARDS - TYPES 114 AND 115

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kashani — Coordinator R.C.E. 19807

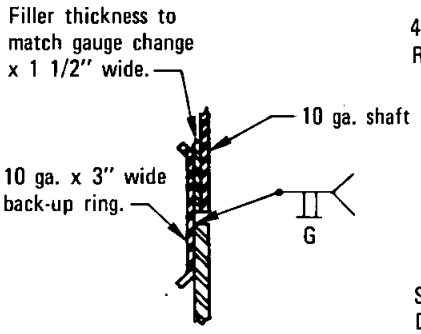
Dec. 1975 — Date

DRAWING NUMBER **E-15**



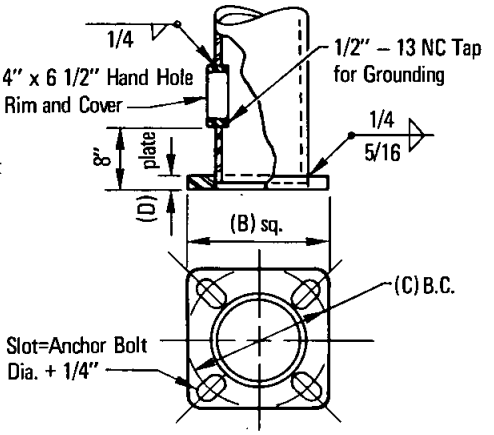
MID - MOUNTED TENON DETAIL

DETAIL–S



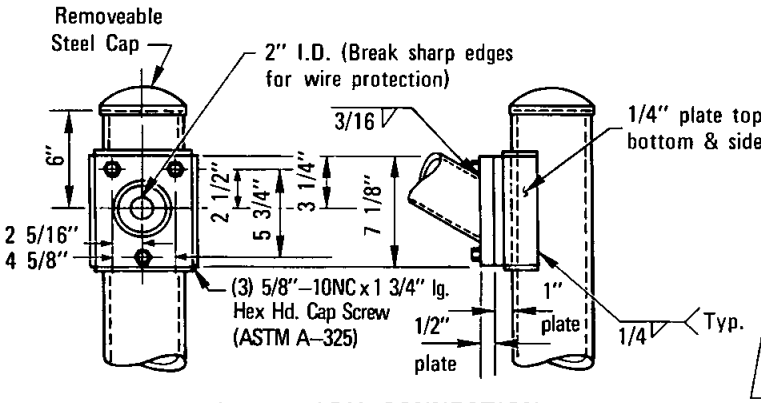
SPLICE DETAIL

DETAIL–T



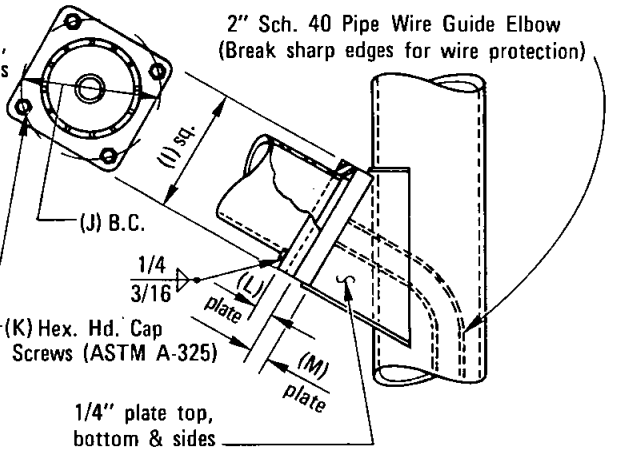
BASE DETAIL

DETAIL–U



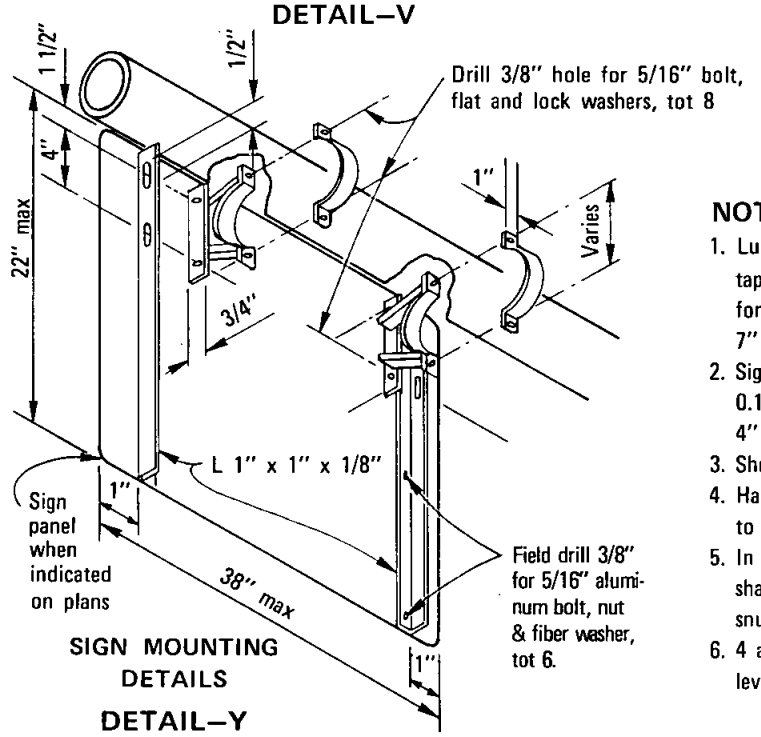
LUMINAIRE ARM CONNECTION

DETAIL–V



SIGNAL ARM CONNECTION

DETAIL–W



SIGN MOUNTING
DETAILS

DETAIL–Y

NOTES

1. Luminaire arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot, with an end section 2 3/8" O.D. for mounting hardware. Extensions of 2" standard pipe about 7" long may be used at the option of the manufacturer.
2. Signal arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot. Extensions of 2" standard pipe about 4" long may be added to accommodate signal mounting hardware.
3. Sheet and plate thickness shown is nominal thickness.
4. Handhole reinforcement ring to be 1/4" X 1 1/2" for 0.1345" to 0.2500" poles, 3/8" X 2" for 0.3125".
5. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from a snug tight condition. No washer will be required.
6. 4 anchor bolts are required for each pole. Provide a hex nut, leveling nut and 2 washers for each anchor bolt.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenchmark — Dec. 1975

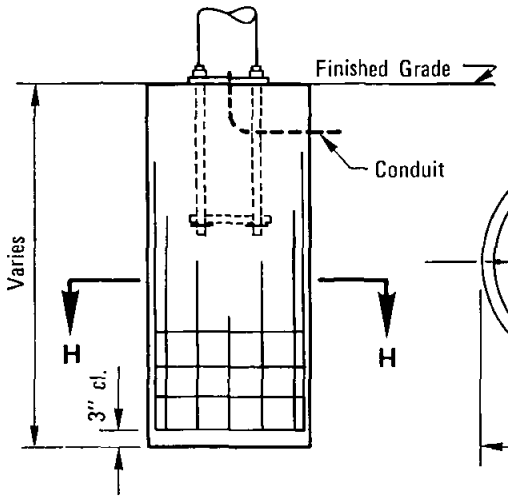
Coordinator R.C.E. 19807 — Date

SAN DIEGO REGIONAL STANDARD DRAWING

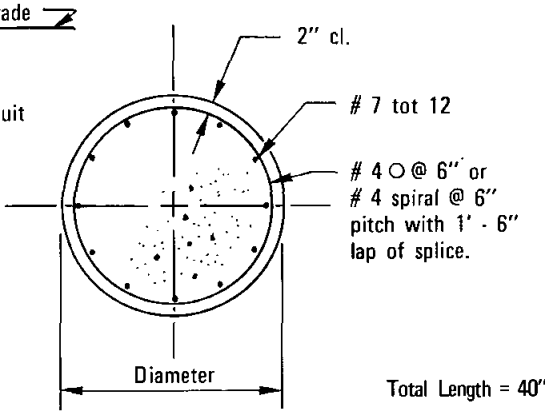
TRAFFIC SIGNAL AND STREET LIGHTING DETAILS

DRAWING NUMBER **E-16**

Revision	By	Approved	Date

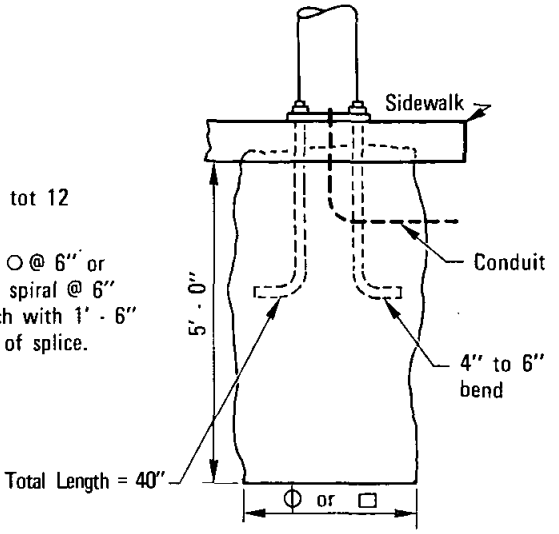


ELEVATION



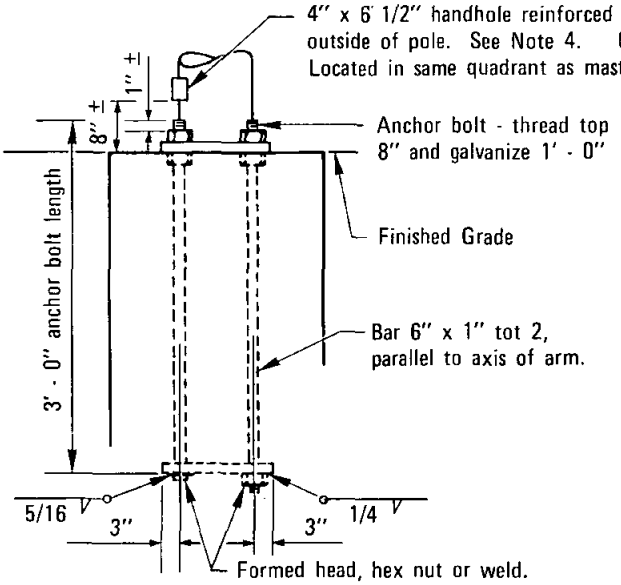
SECTION H–H

CAST–IN–DRILLED HOLE PILE FOUNDATION

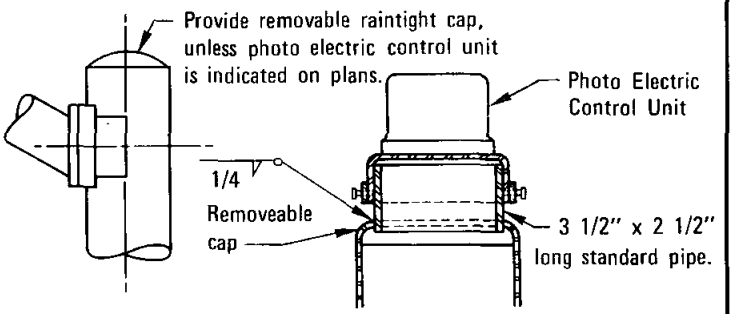


ELEVATION

STANDARD FOUNDATION



HANDHOLE AND ANCHORAGE DETAILS



STANDARD TOP MOUNTING ADAPTER FOR PHOTO ELECTRIC CONTROL UNIT

POLE TOP DETAILS

NOTES

1. Luminaire arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot, with an end section, 2 3/8" O.D., for mounting hardware. Extensions of 2" standard pipe about 7" long may be used at the option of the manufacturer.
2. Signal arms shall be round, tapered steel tubes, maximum taper 0.14 inches per foot. Extensions of 2" standard pipe about 4" long may be added to accommodate signal mounting hardware.
3. Sheet and plate thickness shown is nominal thickness.
4. Handhole reinforcement ring to be 1/4" X 1 1/2" for 0.1345" to 0.2500" poles, 3/8" X 2" for 0.3125".
5. In lieu of the torque requirements for H.S. bolts, cap screws shall be tightened by the turn-of-nut method 1/6 turn from a snug tight condition. No washer will be required.
6. 4 anchor bolts are required for each pole. Provide a hex nut, leveling nut and 2 washers for each anchor bolt.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

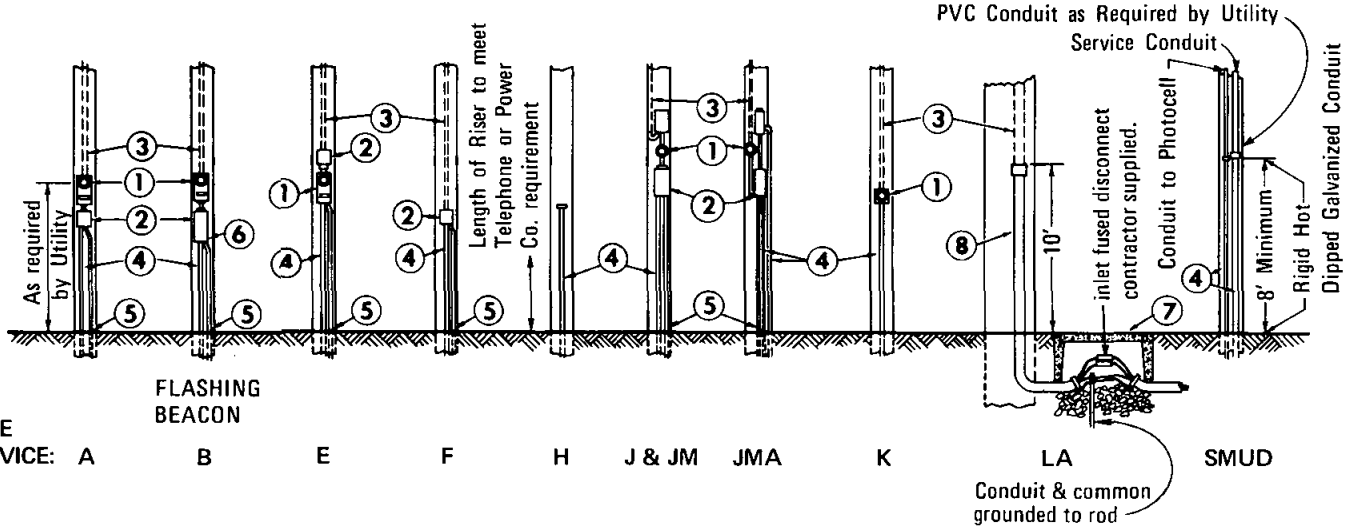
TRAFFIC SIGNAL AND STREET LIGHTING DETAILS

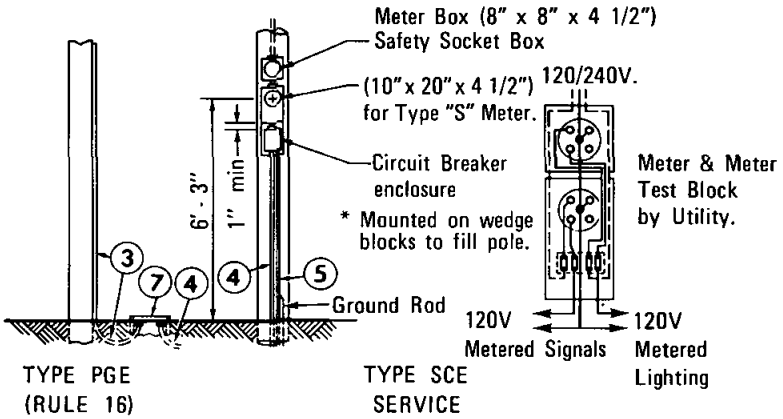
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenkel Dec. 1975

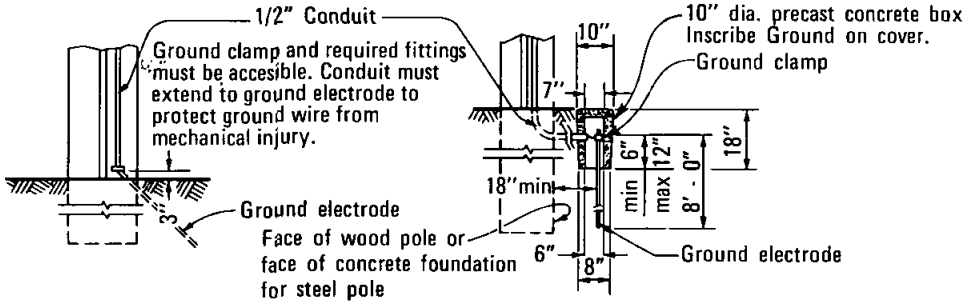
Coordinator R.C.E. 19807 Date

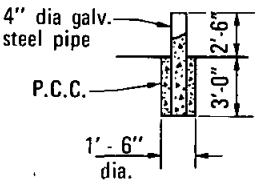
DRAWING NUMBER **E-17**





1. Meter socket
2. Service enclosure 60 amp. size minimum, unless otherwise shown
3. Agency owned pole. Service riser and all other required equipment furnished and installed by Contractor.
4. Conduit, size as required.
5. Ground conduit, 1/2" C, 1 - # 6 AWG bare copper. See "Service Grounding" detail.
6. Flashing Beacon Control
7. Service pull box (# 5 w/ext. unless otherwise noted) furnished and installed by Contractor. Exact location determined by utility.
8. 2" rigid metal conduit furnished and installed by Contractor.

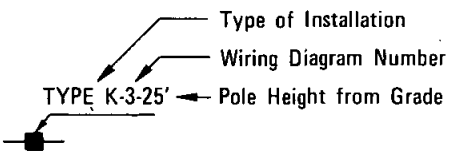




GUARD POST

SERVICE GROUNDING

(Use where serving utility requires 18" between electrode and pole.) Installation shown is for sidewalk or paved areas. Omit special box and locate ground clamp above ground in unpaved areas, or locate ground clamp in nearest electrical pullbox.



POLE MOUNTED SERVICE DESIGNATION

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

POLE MOUNTED SERVICE INSTALLATIONS

DRAWING NUMBER E-18

Revision	By	Approved	Date

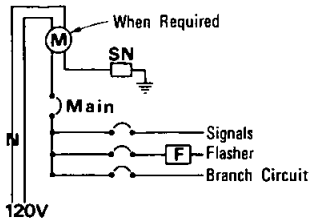


DIAGRAM 1
METERED OR UNMETERED

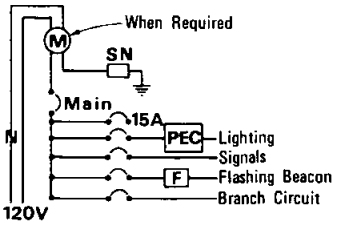


DIAGRAM 2
METERED OR UNMETERED

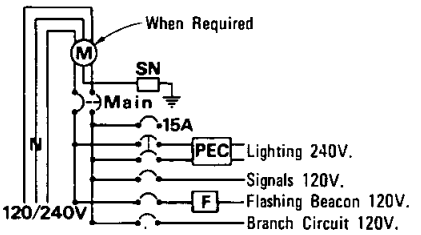


DIAGRAM 3
METERED OR UNMETERED

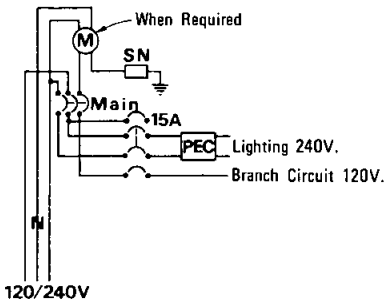


DIAGRAM 4
METERED & UNMETERED

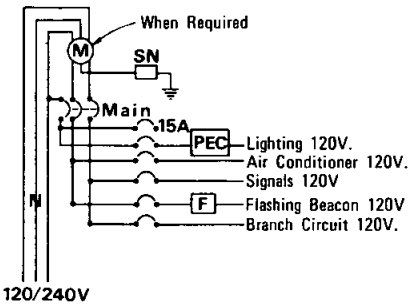


DIAGRAM 5
METERED & UNMETERED

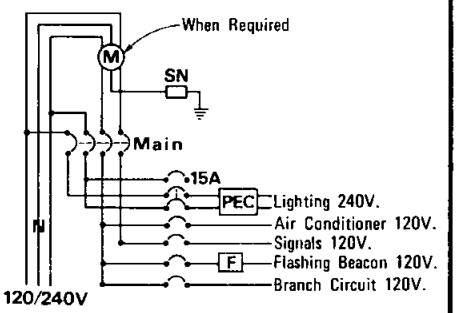


DIAGRAM 6
METERED & UNMETERED

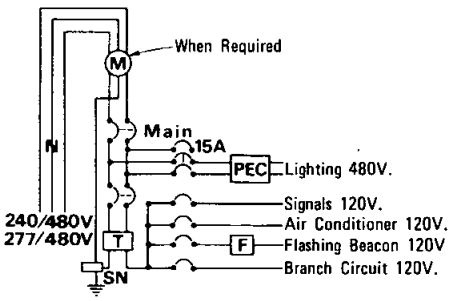


DIAGRAM 7
METERED & UNMETERED

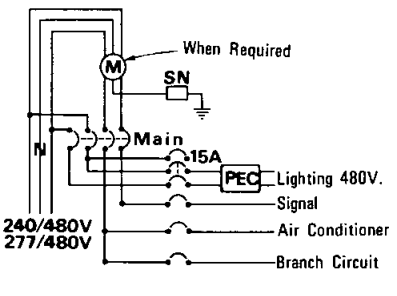


DIAGRAM 8
METERED & UNMETERED

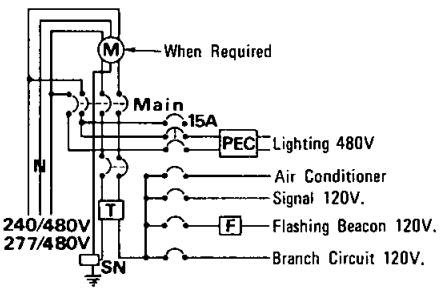
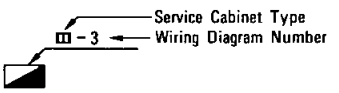
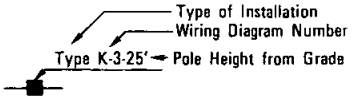


DIAGRAM 9
METERED & UNMETERED



SERVICE CABINET DESIGNATION



POLE-MOUNTED SERVICE DESIGNATION

NOTES

1. For sodium vapor luminaires 2 meters required.
2. Use ground fault interrupter for receptacle outlet.

Revision	By	Approved	Date

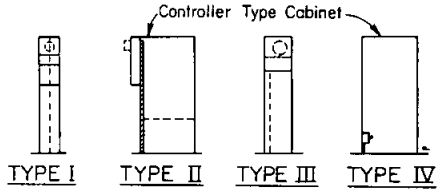
SAN DIEGO REGIONAL STANDARD DRAWING

SERVICE EQUIPMENT WIRING DIAGRAMS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kenkel — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **E-19**

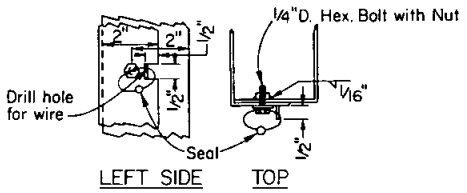


TYPES OF SERVICE (TYPICAL)

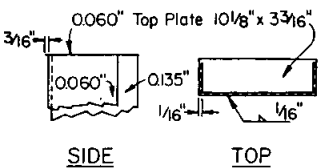
Type I Service Equipment Cabinet mounted on Pedestal Type Wiring Gutter.
Type II Service Equipment Cabinet mounted on side of a Controller Type Cabinet.
Type III & III-A Complete Free-Standing Service Equipment Cabinet.
Type IV Service Disconnect mounted inside a Controller Type Cabinet.

EQUIPMENT ENCLOSURES NOTES

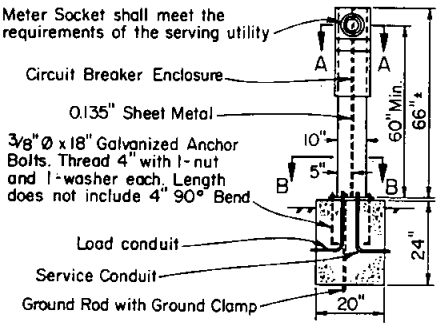
1. Service Equipment Enclosures shall meet the requirements of the serving utility.
2. Service Equipment Cabinets shall be pre-wired and conform to NEMA Standards.
3. All Control Wiring shall be No. 14 TW 19-Strand Machine Tool Wire unless otherwise noted.
4. Each Service Equipment Cabinet shall be provided with engraved phenolic name plate on the Dead Front Panel for each Breaker installed and the Service Point Number and Voltage on the Front Exterior.
5. A Plastic Coated Wiring Diagram shall be provided and attached to the inside of Front Door.
6. All Service Equipment Cabinets shall be NEMA 3-R Construction and shall be provided with Dead Front Panel and provisions for padlocking.
7. All equipment supplied shall be a currently manufactured item.
8. Type I and II Service Equipment Cabinets shall be provided with Dead Front Panels and Outside Top-Hinged Raintight Covers removable without the use of tools.
9. Service conductors installed within a Controller Cabinet (Type II or IV) shall be encased in flexible conduit. Grounding shall be similar to that shown for Type III.
10. When the Utility provides both metered and unmetered circuits, the Service Cabinet shall be provided with a separate bus for each circuit.
11. In unpaved areas, a raised PCC pad of 24" x 4" x width of foundation shall be placed in front of Type I and III Service.
12. Circuit Breakers with Ratings shown on the Plans (and the 15-amp Breaker for the Photoelectric Control, if required) shall be installed in each Service Cabinet.
13. At least 8 standard single pole circuit breaker spaces (3/4" nominal) shall be provided in Type III and III-A service cabinets. This shall include silver plated copper busing and mounting hardware. Busing shall be rated at 125 amp minimum.
14. Type III-A Service Equipment Cabinet shall have at least 1 sq. ft. of combined net area of ventilation openings.



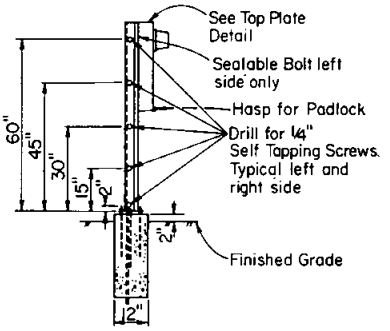
SEALABLE BOLT DETAIL



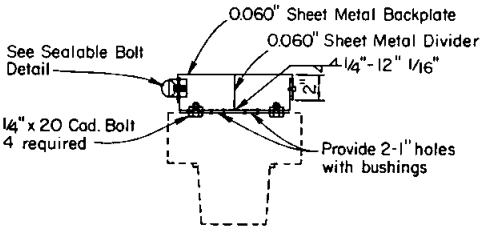
TOP PLATE DETAIL (TYPICAL)



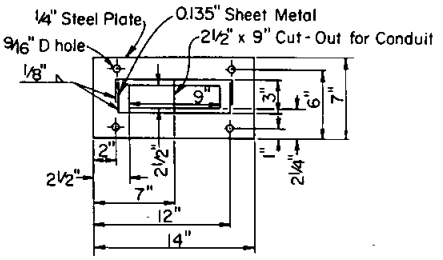
FRONT



LEFT SIDE
TYPE I SERVICE

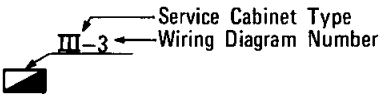


SECTION A–A



SECTION B–B

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

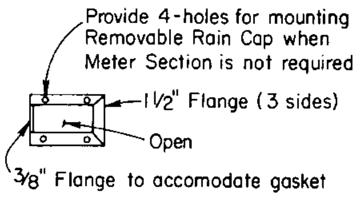
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER E-20

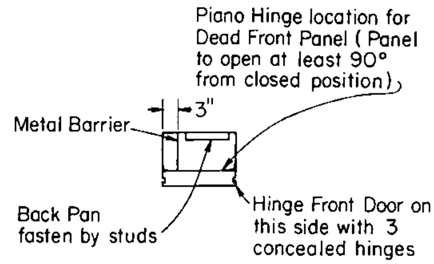
SAN DIEGO REGIONAL STANDARD DRAWING

SERVICE EQUIPMENT CABINETS

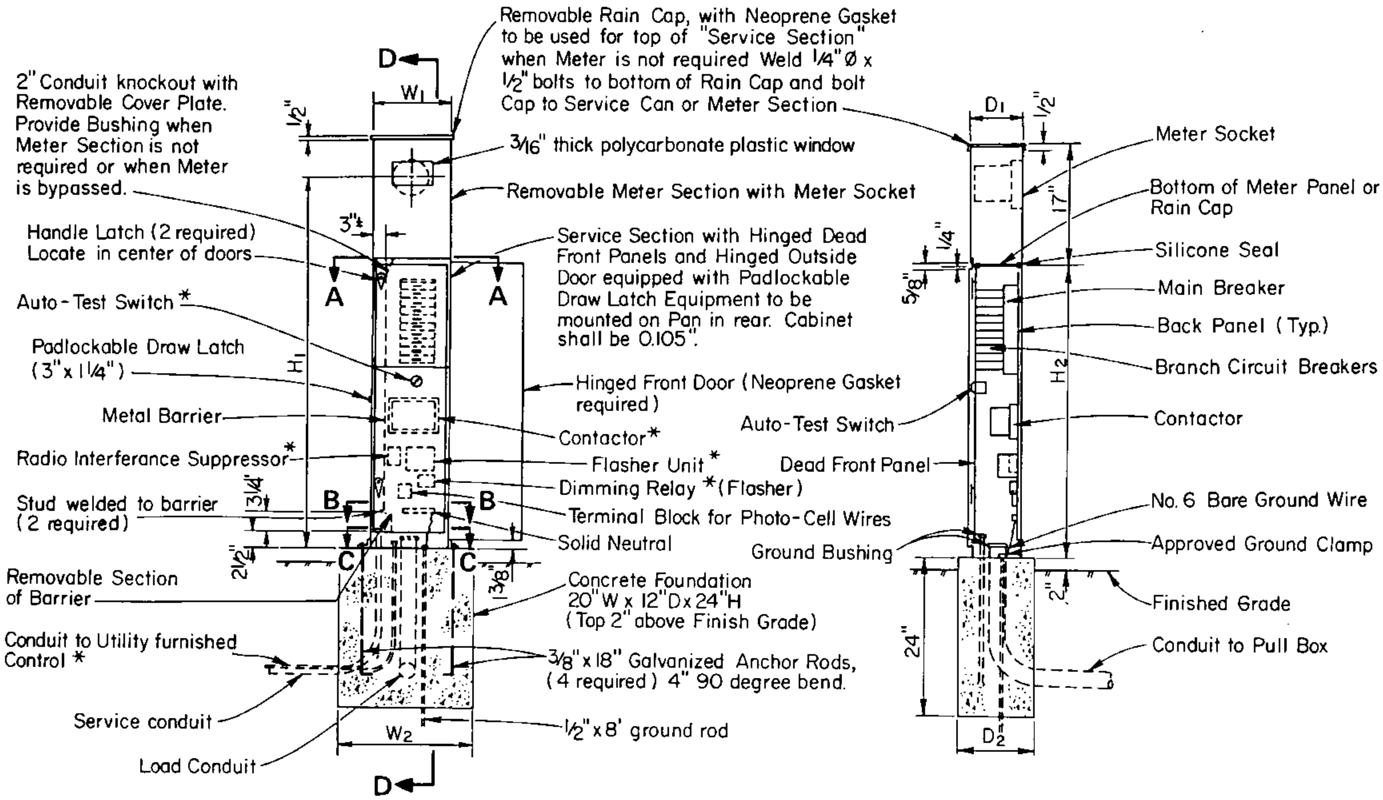
Revision	By	Approved	Date



SECTION A–A



SECTION B–B



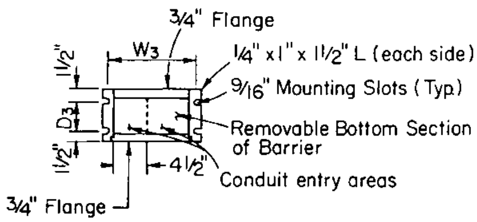
*When Required

FRONT VIEW

SECTION D–D

TYPE III & III-A SERVICE

(Type III Shown)



SECTION C–C

DIMENSION TABLE

TYPE	W_1	W_2	W_3	H_1	H_2	D_1	D_2	D_3
III	12"	20"	14"	54"	43"	8"	12"	4"
III-A	16"	24"	18"	64"	53"	12"	17"	9"

NOTE

See Standard Drawing E-20 for notes.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

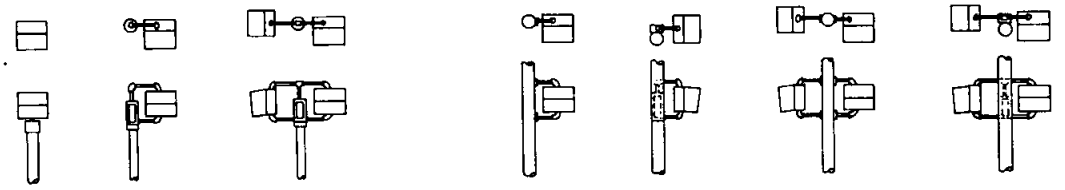
SERVICE EQUIPMENT CABINETS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allard A. Kuchenreuther — Dec. 1975

Coordinator R.C.E. 19807 Date

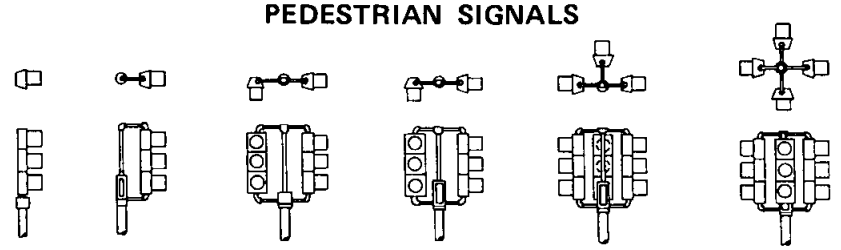
DRAWING NUMBER **E-21**



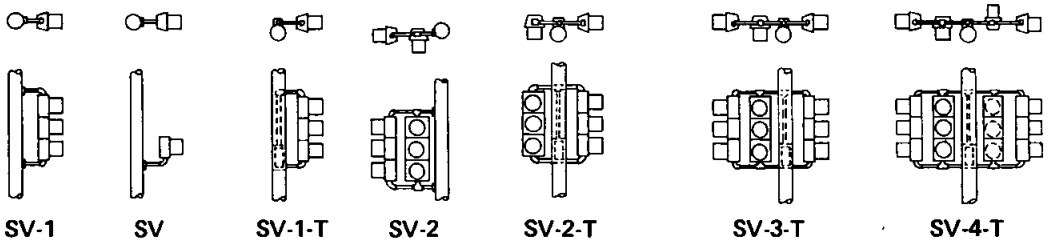
TOP MOUNTINGS

SIDE MOUNTINGS

PEDESTRIAN SIGNALS

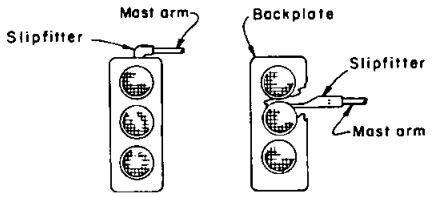


TOP MOUNTINGS



SIDE MOUNTINGS

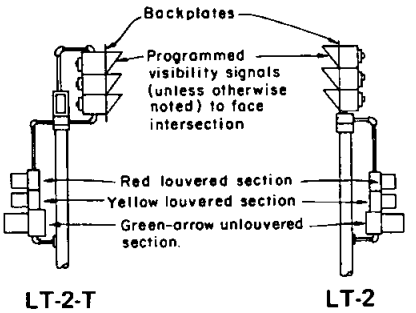
VEHICULAR SIGNALS



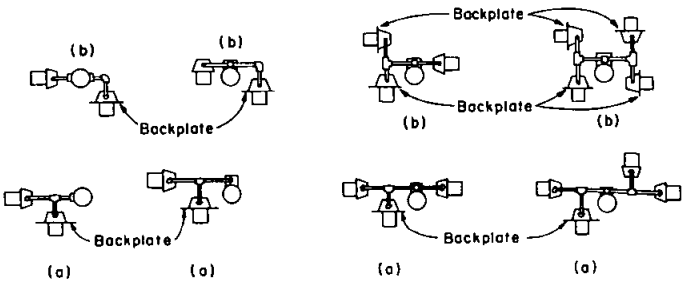
MAT Top attachment

MAS Side attachment

MAST ARM MOUNTINGS



LEFT TURN MOUNTINGS



Typical bracket arrangements when backplates are used.

NOTE

See Standard Drawing E-23 for notes and additional details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

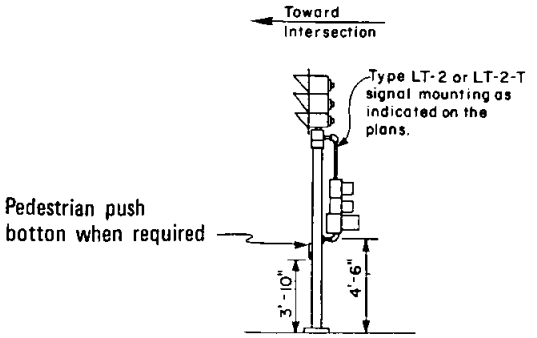
Allan A. Kershaw — Coordinator R.C.E. 19807 — Dec. 1975 Date

SAN DIEGO REGIONAL STANDARD DRAWING

SIGNAL HEADS AND MOUNTINGS

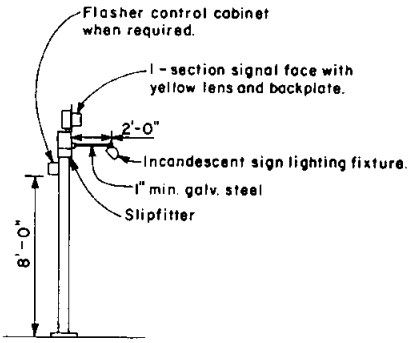
DRAWING NUMBER **E-22**

Revision	By	Approved	Date



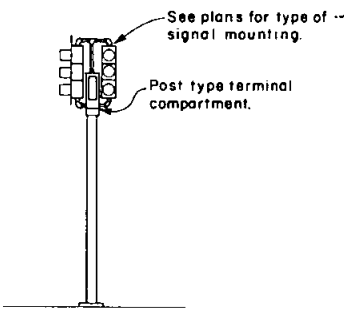
LEFT TURN LANE SIGNALS (LT)

Type 1A,1B or 1C standard
as indicated on the plans



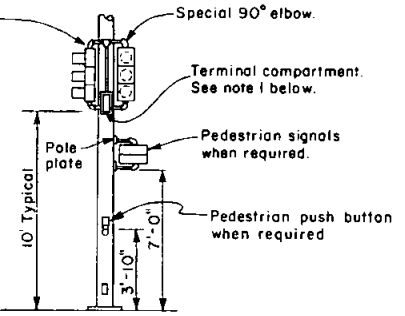
ADVANCE FLASHING BEACON INSTALLATION

Type 1A,1B or 1C standard
as indicated on the plans



TOP MOUNTED SIGNALS (TV)

Type 1A,1B or 1C standard
as indicated on the plans



SIDE MOUNTED SIGNALS (SV & SP)

Normally used on standards with
luminaire and/or signal mast arm

TYPICAL SIGNAL INSTALLATIONS

ABBREVIATIONS

TV	Top mounted Vehicular signals
TP	Top mounted Pedestrian signals
SV	Side mounted Vehicular signals
SP	Side mounted Pedestrian signals
MAT	Mast Arm mounted vehicular signals Top attachment
MAS	Mast Arm mounted vehicular signals Side attachment
LT	Left Turn signals
T	Terminal compartment
1,2,3,4	Number of signal faces (3-section unless otherwise indicated)

NOTES

1. Mountings shall be oriented to provide maximum horizontal clearance to adjacent roadway.
2. Pedestrian signals shall be positioned on the side of standard nearest crosswalk controlled.
3. Bracket arms shall be long enough to permit proper alignment of signals and backplate installation.
4. See Standard Drawing E-24 for attachment fitting details.

Revision	By	Approved	Date

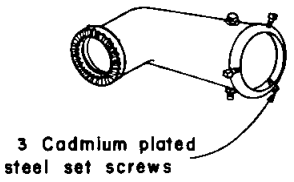
SAN DIEGO REGIONAL STANDARD DRAWING

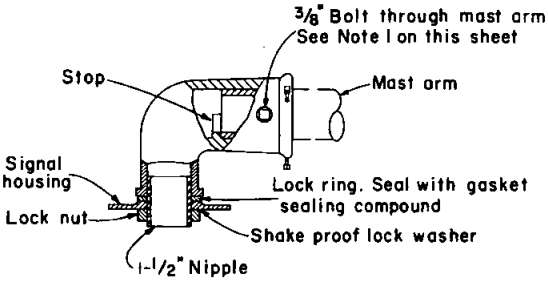
SIGNAL HEADS AND MOUNTINGS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kaufman Dec. 1975
Coordinator R.C.E. 19807 Date

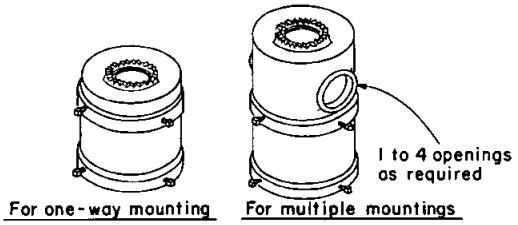
DRAWING NUMBER **E-23**





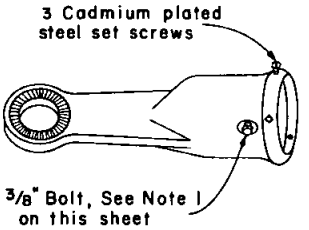
MAST ARM MOUNTING - TYPE "MAT"

For 2" pipe - See Note 1



TOP MOUNTING

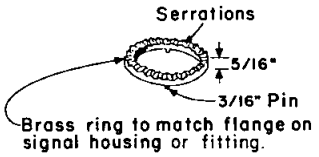
For 4" pipe - See Note 2



MAST ARM MOUNTING TYPE "MAS"

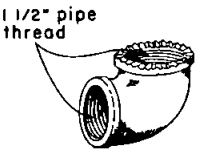
For 2" pipe - See Note 1

SIGNAL SLIP-FITTERS



LOCK RING

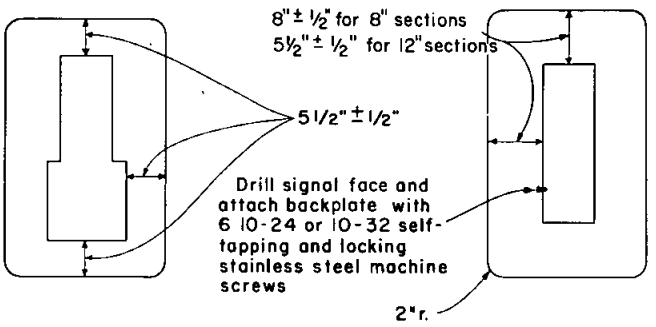
Use where locking ring is not integral with signal housing or fitting.



SPECIAL 90° ELBOW

One for each face, except those with special slip-fitter mounting.

MISCELLANEOUS MOUNTING HARDWARE



FOR COMBINATION 8" & 12" SECTIONS

FOR 8" & 12" SECTIONS

BACKPLATE

0.051" gage or heavier 3003-14 aluminum sheet.

NOTES

1. After mast arm signal has been plumbed and secured, drill 7/16" hole through mast arm in line with slip-fitter hole. Place a 3/8" galvanized bolt with washer under bolt head through hole and secure with nut and lock nut.
2. (a) Threaded top mounted slip fitter openings shall be 1 1/2" I.P.S.
   (b) Serrations in fittings shall match those on bottom of signal heads or in lock ring.
   (c) Top opening shall be offset when backplate is used.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel Dec. 1975

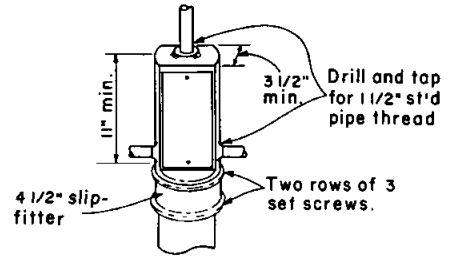
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

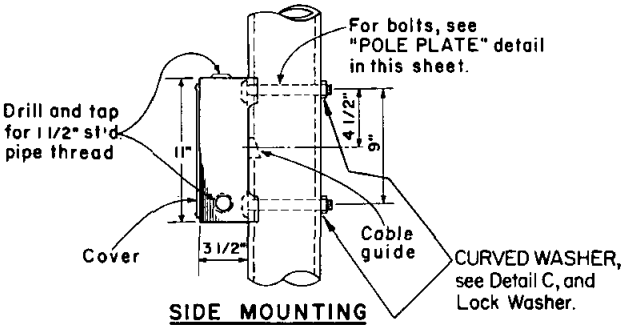
SIGNAL HEADS AND MOUNTINGS DETAILS

DRAWING NUMBER E-24

Revision	By	Approved	Date

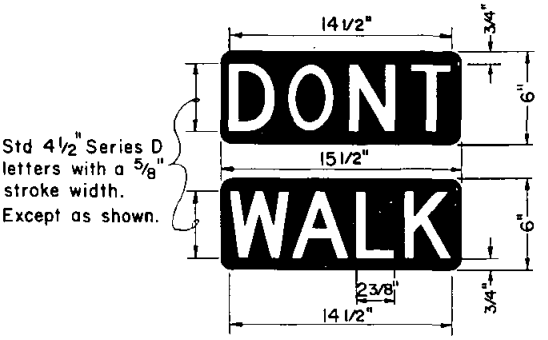


TOP MOUNTING

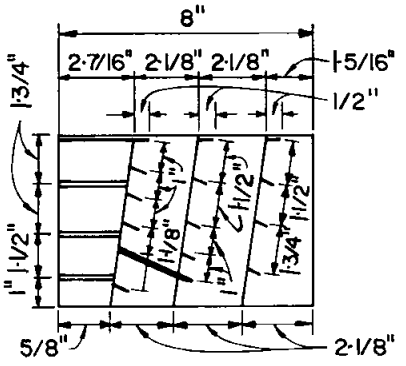


SIDE MOUNTING

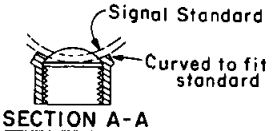
TERMINAL COMPARTMENTS



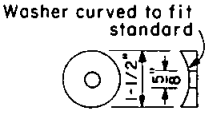
PEDESTRIAN SIGNAL FACE MESSAGES



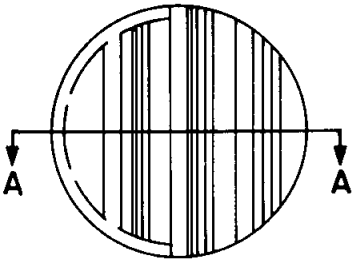
SECTION A-A



SECTION A-A

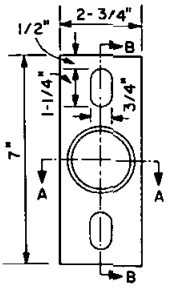


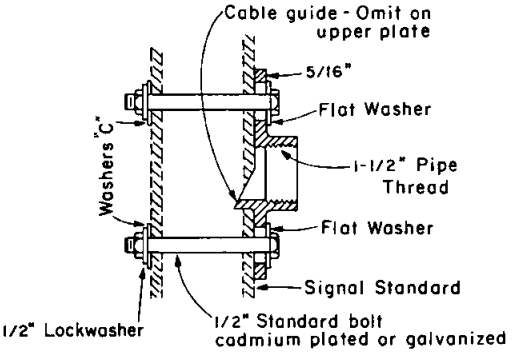
WASHER DETAIL "C"



FRONT VIEW

DIRECTIONAL LOUVER





SECTION B-B

POLE PLATE
For Side Mountings

NOTE

Directional louvers shall be oriented as directed by the Engineer and secured in place with one plated brass machine screw and nut.

Revision	By	Approved	Date

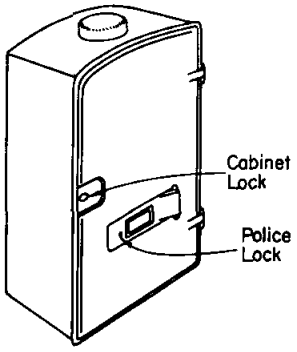
SAN DIEGO REGIONAL STANDARD DRAWING

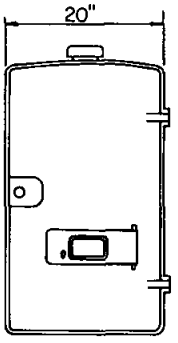
SIGNAL HEADS AND MOUNTINGS DETAILS

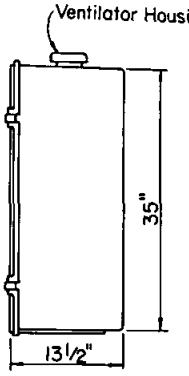
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

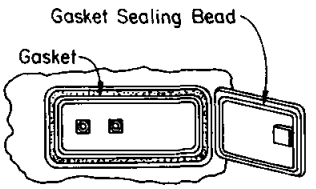
Allan A Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER E-25



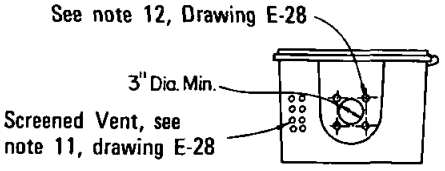




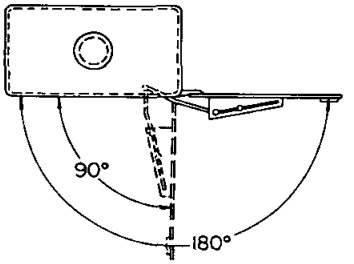


POLICE PANEL

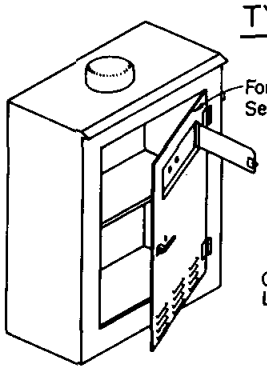
NOTE
See Standard Drawing E-28 for additional notes and details.

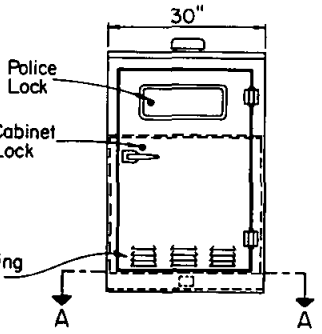


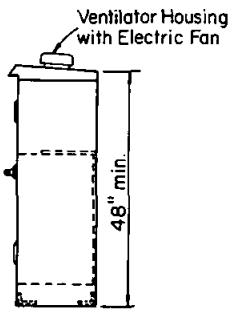
TYPE G CABINET

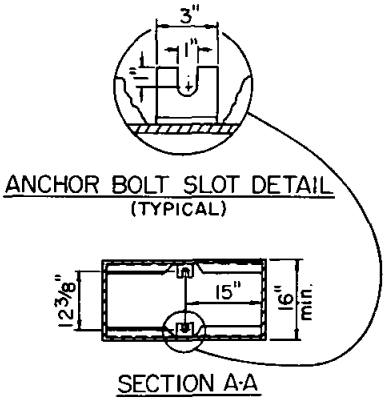


PLAN VIEW SHOWING 2 POSITION DOOR STOP

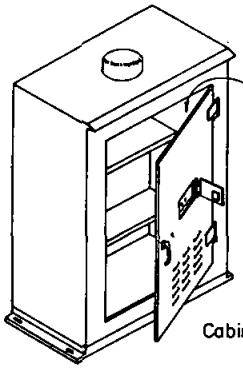


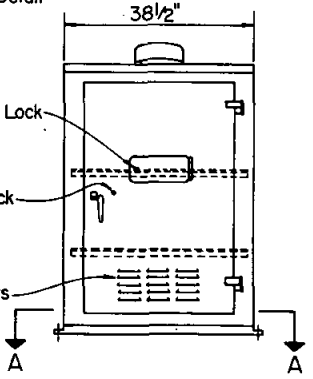


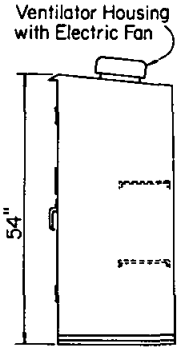


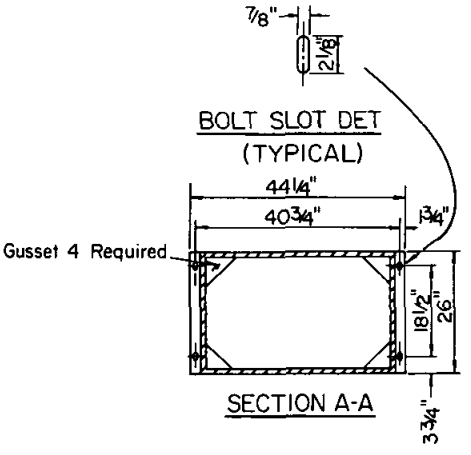


TYPE M CABINET









TYPE P CABINET

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

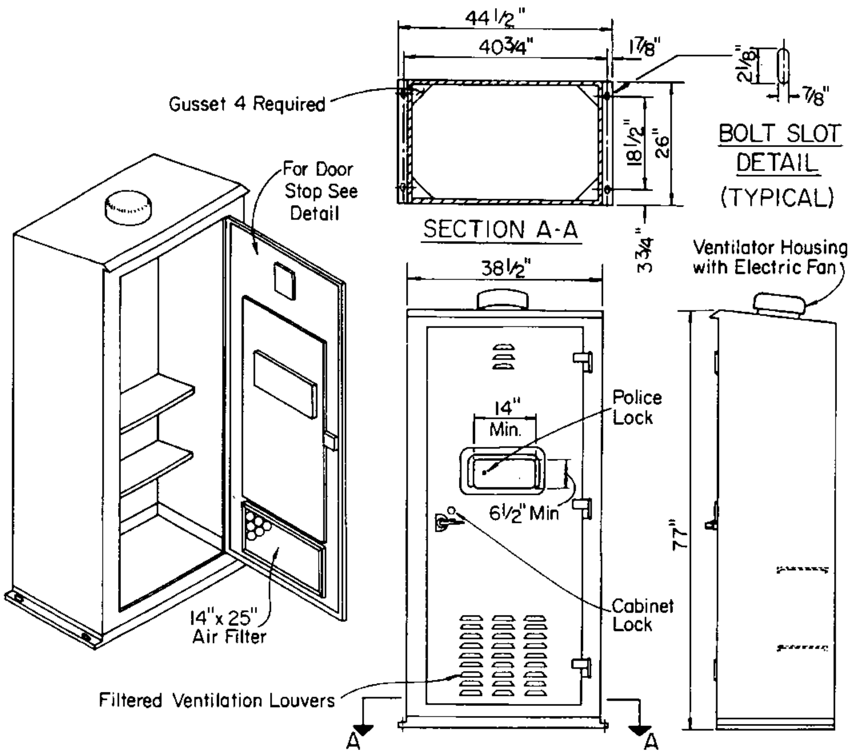
Allan G. Kaufman — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **E-26**

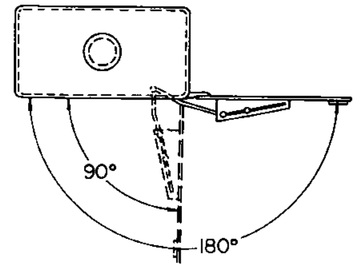
SAN DIEGO REGIONAL STANDARD DRAWING

CONTROLLER CABINETS

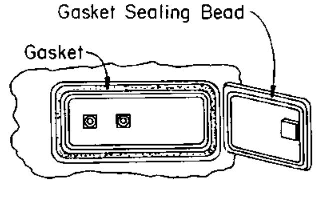
Revision	By	Approved	Date



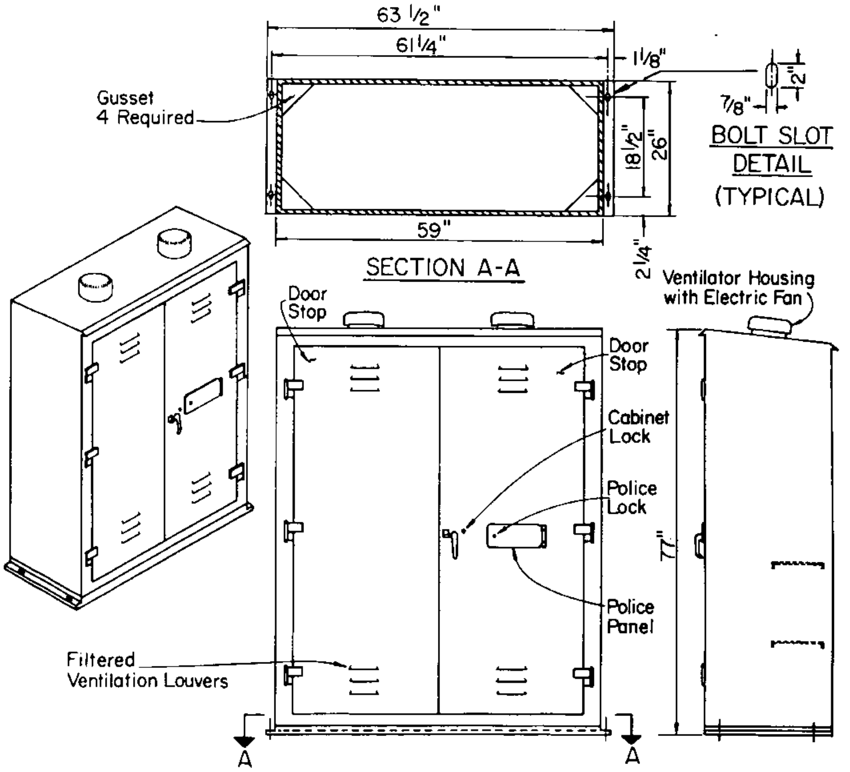
TYPE R CABINET



PLAN VIEW SHOWING 2 POSITION DOOR STOP



POLICE PANEL

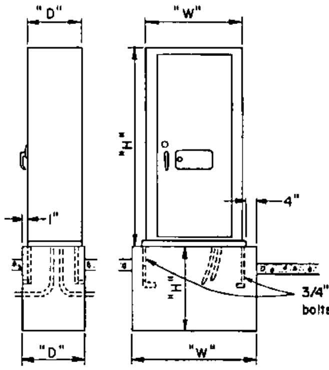


TYPE S CABINET

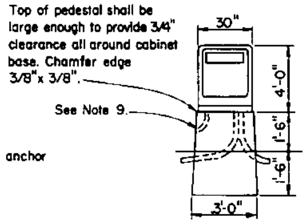
NOTE

See Standard Drawing E-28 for additional notes and details.

Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
					[signature] Dec. 1975 Coordinator R.C.E. 19807 Date
				CONTROLLER CABINETS	DRAWING NUMBER **E-27**



TYPICAL CABINET

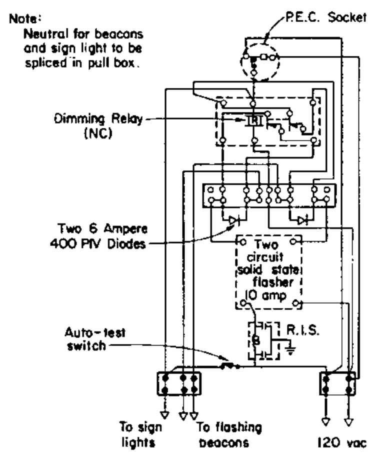


P.C.C. PEDESTAL FOUNDATION
FOR TYPE M CABINET

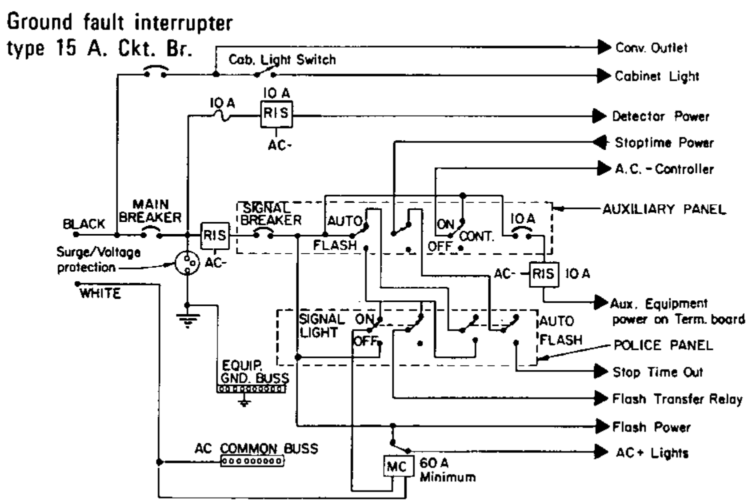
CABINET				FOUNDATION			BOLT MOUNTING	
TYPE	H	W	D	H	W	D	D	W
G	35"	20"	13 5/8"	36"	24"	24"	BOLT CIRCLE (AS REQ)	
M	48"	30"	16"	36"	36"	22"	12 3/8"	
P	54"	38 1/2"	26"	24"	50"	30"	18 1/2"	40 3/4"
R	77"	38 1/2"	26"	24"	50"	30"	18 1/2"	40 3/4"
S	77"	59"	26"	24"	70"	30"	18 1/2"	61 1/4"

NOTES – CONTROLLER CABINETS

1. All cabinet dimensions are nominal.
2. Foundations shall be located to provide 2'-0" minimum clearance between face of curb and back of cabinet.
3. All anchor bolts shall be bonded to conduit.
4. Where telephone interconnect equipment is specified, a minimum of 5 inches clear vertical space shall be provided inside the cabinet for the equipment.
5. Telephone interconnect conductors shall be enclosed in a 3/4" or larger conduit through the cabinet foundation. Flexible metal conduit shall be used to separate telephone and power conductors in cabinets and pedestals. Telephone conduit shall terminate in a pull box for interconnect conductors only.
6. In unpaved areas, a raised P.C.C. pad shall be placed in front of each controller cabinet. Pad shall be 3'-0" x 3'-0" x 0'-4" for steel pedestal mounted cabinets, and shall be 3'-0" x 0'-4" thick x width of foundation for Type M, P, R or S cabinets.
7. In unpaved areas, the top of foundation for Types G, P, R and S cabinets shall be 6" above surrounding grade. Top of foundation for Type M cabinet shall be 18" above surrounding grade.
8. In sidewalks and other paved areas, top of foundation for Type G cabinet shall be level with surrounding grade. Top of foundation for Type M cabinet shall be 18" above surrounding grade. Top of foundation for Type P, R, and S cabinets shall be 4" above surrounding grade.
9. A 1" drain shall be provided through the foundation of the Type M cabinet. Drain pipe shall be screened.
10. The pedestal, base, bolt circle and foundation for the Type G cabinet shall be the same as that shown for a Type I-C standard. Pedestal shall be 25"-30" in length.
11. Provide 8 screened, raintight vent holes, 1/2" diameter or larger in the bottom of the Type G cabinet.
12. Type G cabinet shall be provided with slipfitter to permit mounting on 4 1/2" O.D. pedestal. Slipfitter shall bolt to bottom of the cabinet.
13. All cabinet shelves shall be removeable and adjustable for vertical spacing. Type M, P, R and S cabinets shall be provided with a minimum of 2 shelves.
14. Anchor bolts for Type M, P, R and S cabinets shall be 3/4" x 18" with a 2"-90° bend. Four bolts required per cabinet. Anchor bolts may be inside or outside of cabinet.
15. See Table for cabinet and foundation dimensions; "D"-Depth, "H"-Height, "W"-Width. See Table for anchor bolt spacing; "D"-Depth, "W"-Width.
16. Controller units, shelf mounted equipment and wall mounted equipment shall be located to permit easy and safe removal or replacement. All plug mounted equipment shall be located so as to permit its replacement without removing any other piece of equipment.
17. Main Breaker shall be rated for 30 amperes in Type G and M cabinets. It shall be rated at 60 amperes in Type P, R and S cabinets.



WIRING DIAGRAM
FLASHING BEACON CONTROL UNIT



WIRING FOR SOLID–STATE CONTROLLER CABINETS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Keuhmel (signature) Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **E-28**

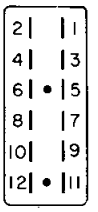
SAN DIEGO REGIONAL STANDARD DRAWING

CONTROLLER CABINET DETAILS

Revision	By	Approved	Date

The Solid-state Switching devices shall intermate with a CINCH-JONES Socket S-2412-SB or equal connected as follows:

Pin No.	CIRCUIT	Pin No.	CIRCUIT
1	AC + Lights	7	Green or Walk Output
2	Chassis Ground	8	Yellow Input
3	Red or Dont Walk Output	9	DC + (15 to 24 volts)
4	Not Used	10	Green or Walk Input
5	Yellow Output	11	AC-
6	Red or Dont Walk Input	12	Not Used

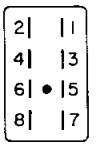


Contacts shall be rated at 15 amperes min.

CONNECTOR SOCKET
SOLID STATE SWITCHING DEVICE

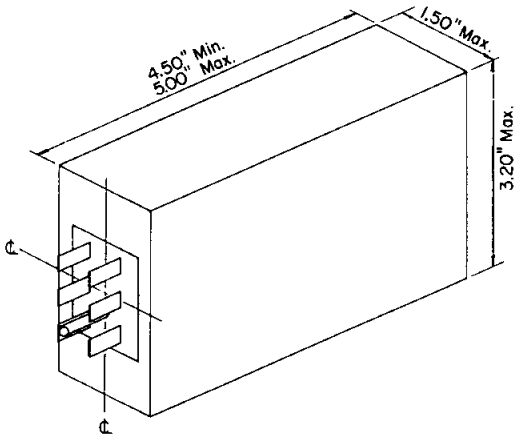
The Flash Transfer Relay shall intermate with a CINCH-JONES Socket S-408-SB or equal connected as follows:

Pin No.	CIRCUIT	Pin No.	CIRCUIT
1	Coil	5	Common, Circuit #1
2	Coil	6	Common, Circuit #2
3	N.C. Circuit #1	7	N.O. Circuit #1
4	N.C. Circuit #2	8	N.O. Circuit #2

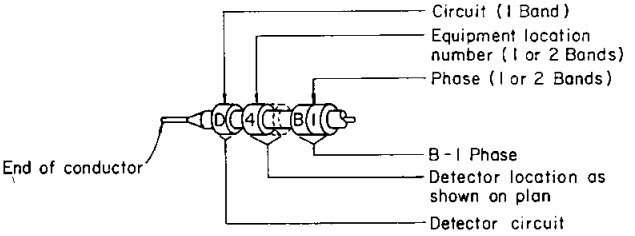


Contacts shall be rated at 15 amperes min.

CONNECTOR SOCKET
FLASH TRANSFER RELAY



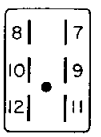
ENCLOSURE FOR
SOLID STATE FLASHER UNIT



TYPICAL BANDING OF CONDUCTOR ENDS

The FLASHER shall intermate with a CINCH-JONES Socket S-406-SB or equal connected as follows:

Pin No.	CIRCUIT	Pin No.	CIRCUIT
7	Load, Ckt. #1	10	AC^-
8	Load, Ckt. #2	11	AC^+
9	Chassis Ground	12	Logic Ground



CONNECTOR SOCKET
SOLID STATE FLASHER UNIT

Revision	By	Approved	Date

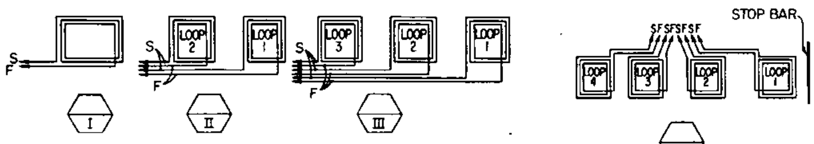
SAN DIEGO REGIONAL STANDARD DRAWING

CONTROLLER CABINET DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenchmark — Coordinator R.C.E. 19807 — Dec. 1975 Date

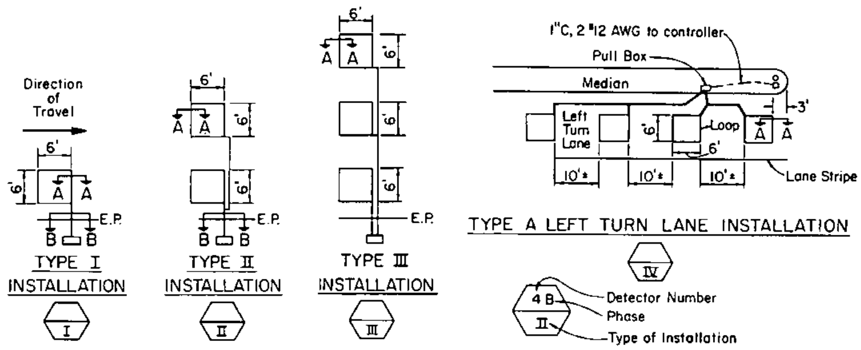
DRAWING NUMBER **E-29**



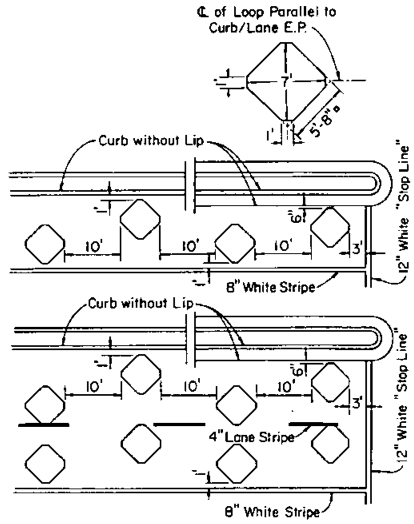
LOOP WINDING PATTERNS

Conductor identification shall include the following:

1. Sensor number and phase. 2. Loop number. 3. Start (S) or finish (F) (Typical identification: D-4-CI-LOOP 2-S)



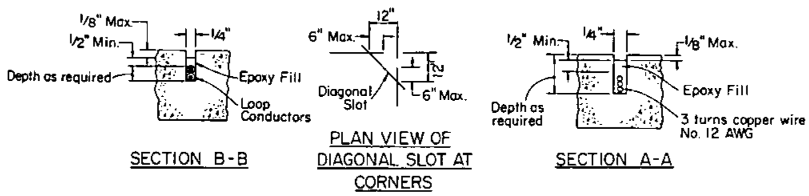
DETECTOR LAYOUTS AND DIMENSIONS



TYPE B INSTALLATION

TYPICAL ONE AND TWO LANE LEFT TURN DETECTORS PLACEMENT DETAILS

(Use Only When Specified)



SLOT DETAILS

LOOP INSTALLATION PROCEDURE

1. Saw slots in pavement for loop conductors as shown in details. Blow out and dry thoroughly with compressed air.
2. Install termination pull box.
3. Install # 14 AWG loop conductor in slots using a 3/16" to 1/4" thick wood paddle (see "Loop Winding Patterns"). Allow additional length for the run to termination pull box plus 5 feet of slack in pull box. This additional length of conductor for each loop circuit shall be twisted together into a pair (at least 2 turns per foot) before being run to pull box.
4. Identify loop circuit pairs by sensor unit designation. Identify start of conductor.
5. Splice loop conductor to lead-in cable (where required) or tape ends of conductor (after testing) to prevent entrance of moisture. All splices shall be soldered using rosin core solder.
6. Test each loop circuit at controller cabinet (or if these are not installed, test at termination pull box) before filling slots. Perform a resistance test between circuit and between each circuit and ground. Insulation resistance shall be not less than 100 megohms. Test each loop circuit for continuity; loop circuit resistance shall not exceed 0.5 ohms plus 0.35 ohms per 100 feet of lead-in cable.
7. Fill slots as shown in details.
8. No more than four loop detector conductors shall be installed in one saw slot.
9. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet.
10. Distance between side of loop and lead-in saw cut shall be 2' - 0" minimum. Distance between lead-in cuts shall be 6".
11. The Engineer shall have the authority to suspend epoxy fill operations due to unsuitable weather.
12. See Standard Drawing E-31 for curb termination details.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allard A. Kerchival (signature) — Dec. 1975

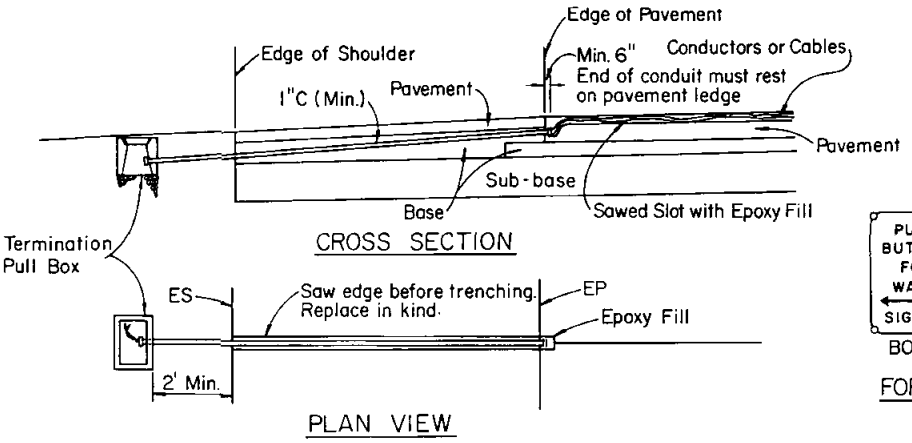
Coordinator R.C.E. 19807 — Date

SAN DIEGO REGIONAL STANDARD DRAWING

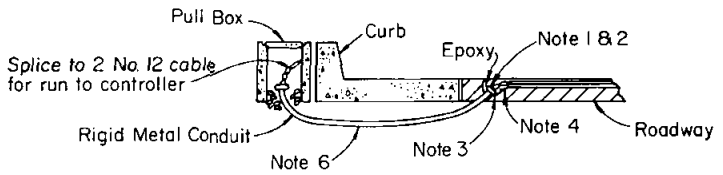
DETECTORS - INDUCTIVE LOOP

DRAWING NUMBER **E-30**

Revision	By	Approved	Date

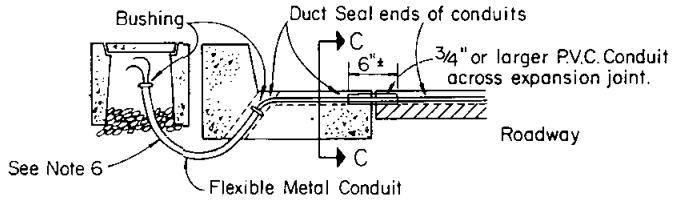


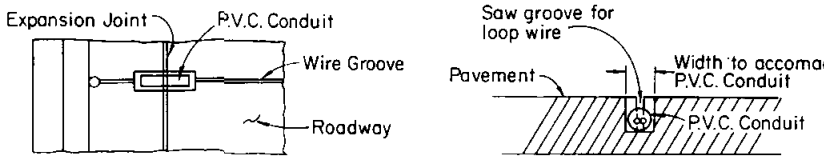
SHOULDER TERMINATION DETAIL



1. Non-metallic bushing shall be used at roadway end of conduit.
2. Tape wire 3 inches each side of roadway bushing.
3. Install duct seal compound to each end of roadway conduit before installing epoxy.
4. Round all sharp edges where wire has to pass.
5. End of roadway conduit shall be 2 inches below roadway.
6. Install 1" conduit minimum. Install 2" conduit for more than 4-#12 loop conductors or 3 magnetometer cables.

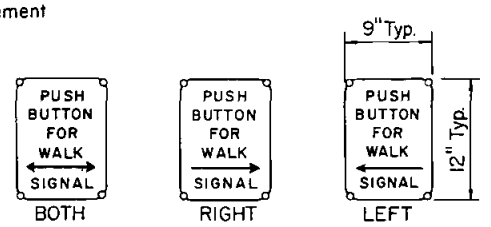
CURB TERMINATION DETAIL TYPE A



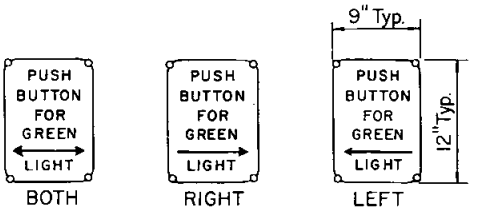


CURB TERMINATION DETAIL TYPE B

(Use only when specified)



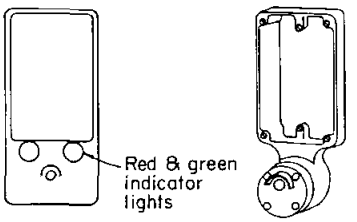
FOR WALK-DONT WALK SIGNALS



FOR 3-LIGHT SIGNALS

PEDESTRIAN PUSHBUTTON SIGNS

Signs shall be porcelain enameled.
Black letters on White background.



TYPE A (Use Only When Specified)

TYPE B

TYPE C (Use Only When Specified)

PEDESTRIAN PUSH BUTTONS

1. Shape back of casting to fit curvature of post.
2. Provide cover fitting for top of post, when PPB is mounted on pedestrian push button post.
3. Install pushbutton on crosswalk side of standard.

Revision	By	Approved	Date

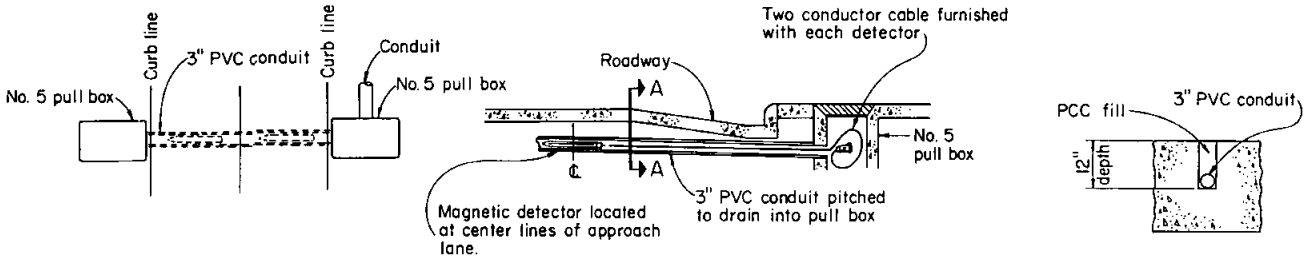
SAN DIEGO REGIONAL STANDARD DRAWING

DETECTORS - CURB TERMINATION AND PUSH BUTTON DETAILS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

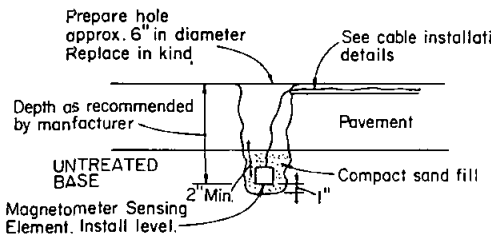
Allan A. Kershaw — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **E-31**

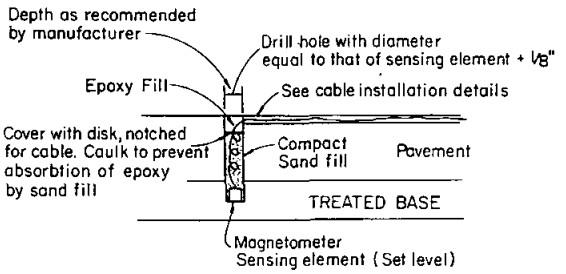


PLAN ELEVATION SECTION A-A

NON-DIRECTIONAL MAGNETIC VEHICLE DETECTOR INSTALLATION DETAILS

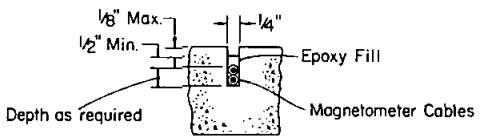


LIGHT DUTY ROADWAY
(WITH UNTREATED BASE)



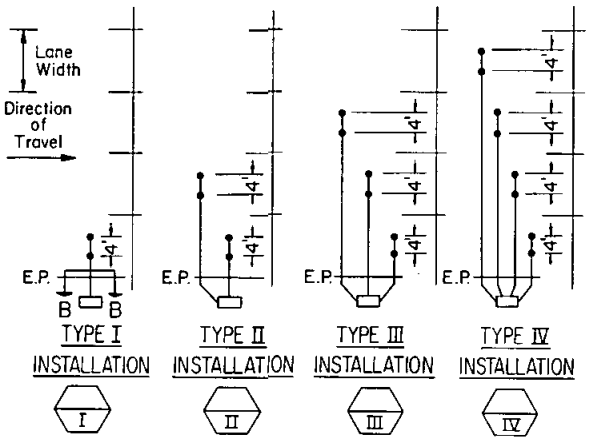
HEAVY DUTY ROADWAY
(WITH TREATED BASE)

MAGNETOMETER SENSING ELEMENT INSTALLATION DETAILS



SECTION B-B

SLOT DETAILS



LAYOUTS AND DIMENSIONS

MAGNETOMETER DETECTOR INSTALLATION PROCEDURE:

1. Prepare holes for sensing elements and saw slots in pavement for connecting cables as shown in details. Blow out and dry thoroughly with compressed air.
2. Install termination pull box. See termination details.
3. Install heads in holes and install cables in slots using a 3/16" to 1/4" thick wood paddle and run to adjacent pull box allowing 5 feet of slack at the pull box.
4. Identify cables by lane or sensor unit designation (traffic signal systems).
5. Splice sensing element cables to lead-in cables. All splices shall be soldered using rosin core solder.
6. Test each sensing element circuit at controller or count station cabinet before filling holes and slots. Excitation circuits shall have a resistance of 50 ohms* per head and detection circuits shall have a resistance of 300 ohms* per head. Measurements shall be made with a low range ohm-meter.
7. Fill slots and sensing element holes as shown in details.
8. Lead-in cable shall not be spliced between the termination pull box and the controller cabinet.
9. See Standard Drawing E-28 for curb termination details.

*Or other resistance per manufacturers' specifications

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A Kercheval Dec. 1975
Coordinator R.C.E. 19807 Date

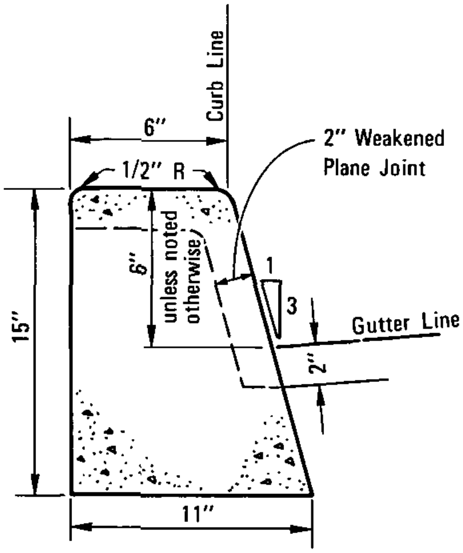
SAN DIEGO REGIONAL STANDARD DRAWING

Revision	By	Approved	Date

DETECTORS - NON-DIRECTIONAL MAGNETIC AND MAGNETOMETER

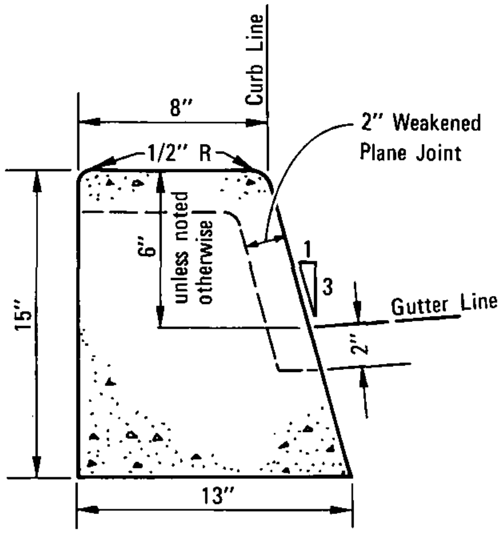
DRAWING NUMBER E-32

GENERAL SURFACE IMPROVEMENTS



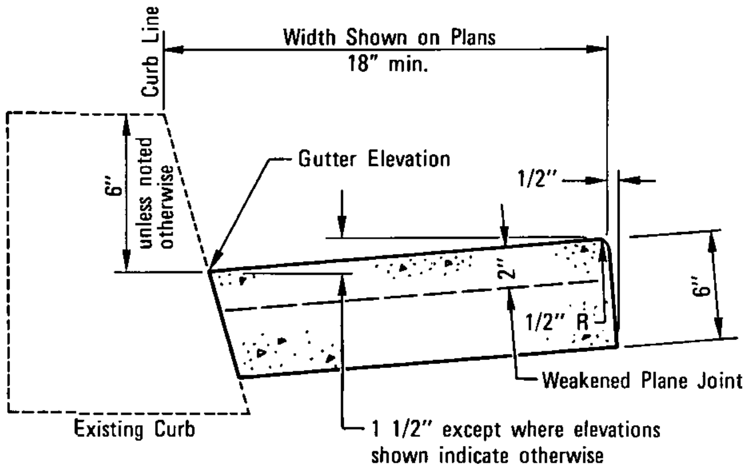
6" CURB

Area = 0.89 SQ. FT.



8" CURB

Area = 1.09 SQ. FT.



GUTTER

LEGEND ON PLANS

6" curb

NOTES:

1. Concrete shall be 517 - C - 2500.
2. See Standard Drawing G-10 for joint details.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

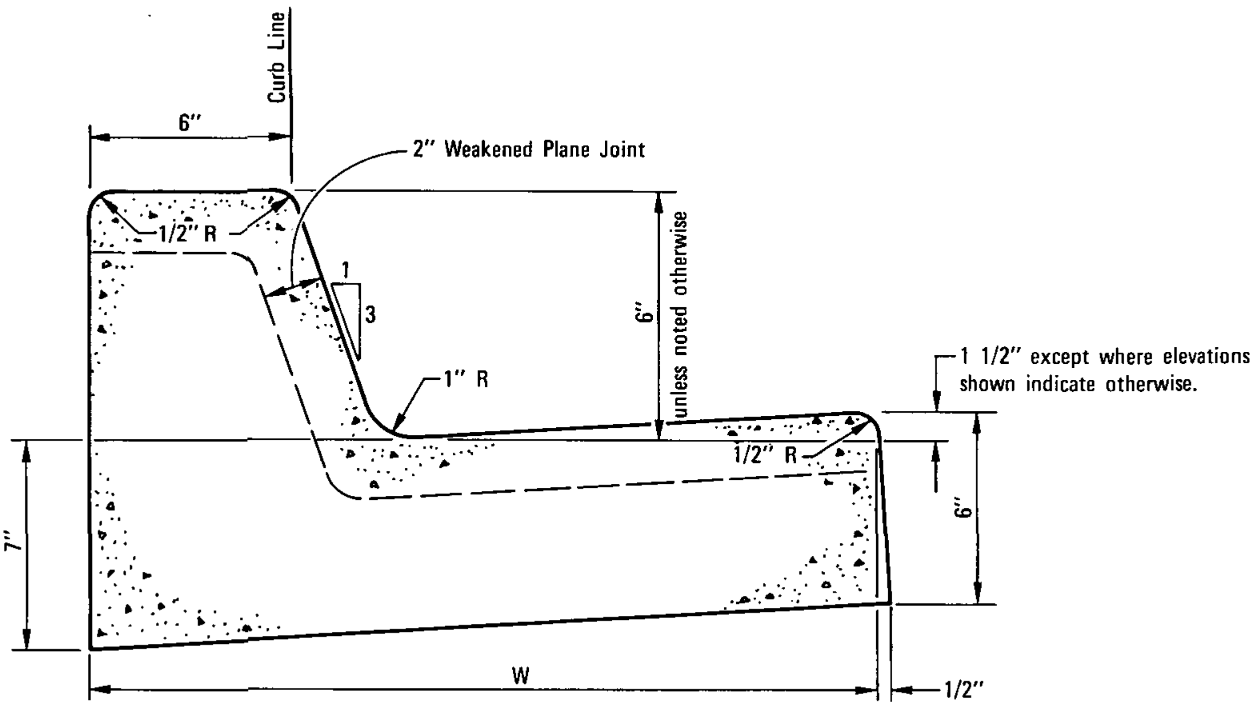
CURBS AND GUTTER - SEPARATE

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A. Kuchera Dec. 1975

Coordinator R.C.E. 19807 Date

DRAWING NUMBER **G-1**



TYPE G & H CURB

TYPE	W	*AREA SQ. FT.
G	24"	1.34
H	30"	1.61

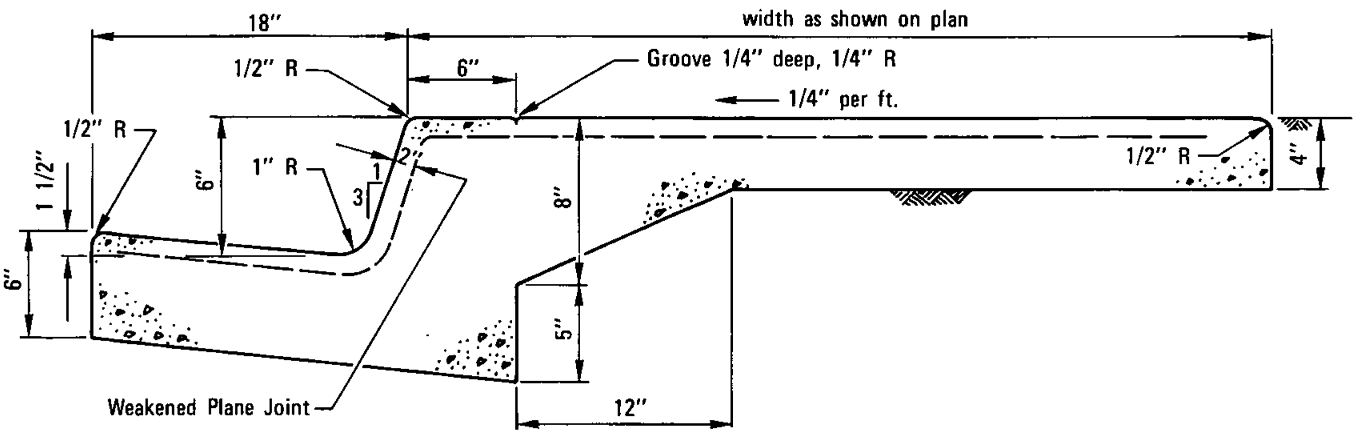
* with 6" Curb Face

NOTES:

1. Concrete shall be 517 - C - 2500.
2. See Standard Drawing G-10 for joint details.

LEGEND ON PLANS

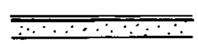
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE Coordinator R.C.E. 19807 Dec. 1975 Date	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
DRAWING NUMBER **G-2**	**CURB AND GUTTER - COMBINED**				



NOTES

1. Concrete shall be 517-C-2500.
2. See Standard Drawing G-10 for joint details.
3. Monolithic curb, gutter and sidewalk is to be used with Agency approval only.

LEGEND ON PLANS



Revision	By	Approved	Date

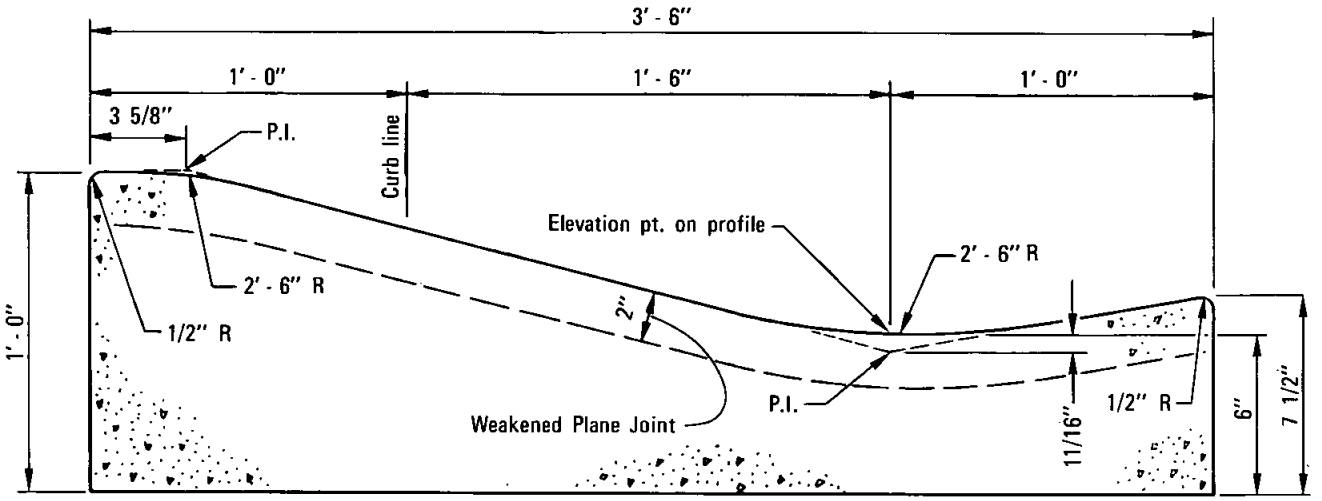
SAN DIEGO REGIONAL STANDARD DRAWING

MONOLITHIC CURB, GUTTER AND SIDEWALK

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allard A. Kerhund [signature] Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **G-3**



CURB AREA
(2.33 sq. ft.)

NOTES
1. Transition to type G curb at all curb returns, except where sidewalk ramps are provided, and at all cul-de-sacs with drainage structures.
2. See Standard Drawing D-6 for Rolled Curb Inlet.
3. Concrete shall be 517 - C - 2500.
4. See Standard Drawing G-10 for joint details.

LEGEND ON PLANS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

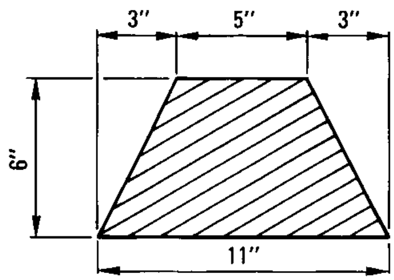
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER G-4

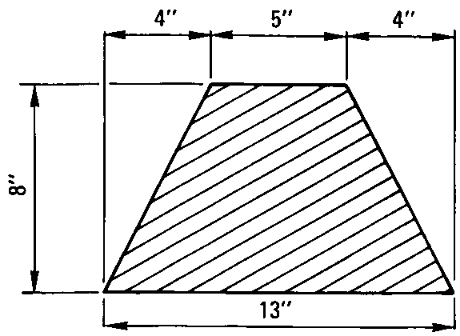
SAN DIEGO REGIONAL STANDARD DRAWING

CURB AND GUTTER - ROLLED

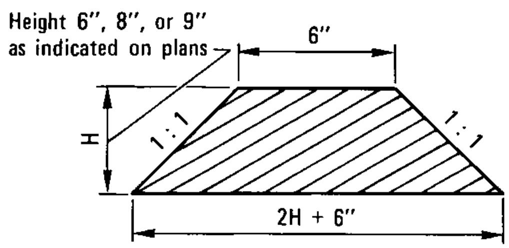
Revision	By	Approved	Date



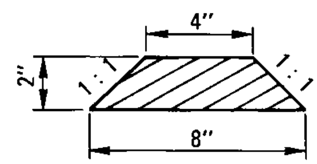
TYPE A-SECTION



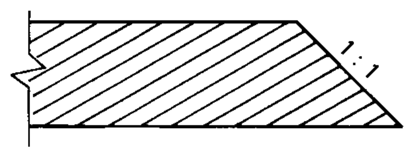
TYPE B-SECTION



TYPE C-SECTION



TYPE D-SECTION



Slope end of dike 1 : 1
when not joining
other improvements

ALL TYPES—SIDE VIEW

APPROX. DIKE QUANTITIES	
TYPE	TONS/LIN. FT.
A	0.0250
B	0.0375
C–6"	0.0375
C–8"	0.0583
C–9"	0.0702
D	0.0062

NOTES

1. Dike is to be placed on a minimum 2" of A.C. road surfacing, extending throughout the width of the dike.
2. AR-8000 grade asphalt to be used for all dikes
3. A.C. dikes may be shaped and compacted with an extrusion machine or other equipment capable of shaping and compacting the material to the required cross section.

LEGEND ON PLANS

Type A Dike

Revision	By	Approved	Date

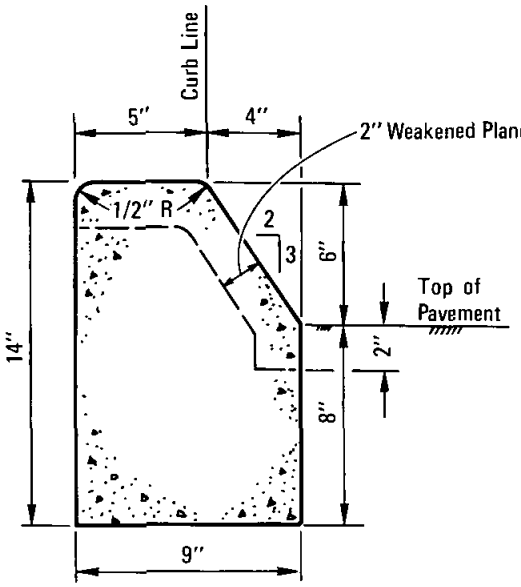
SAN DIEGO REGIONAL STANDARD DRAWING

DIKES (BERMS) - ASPHALT CONCRETE

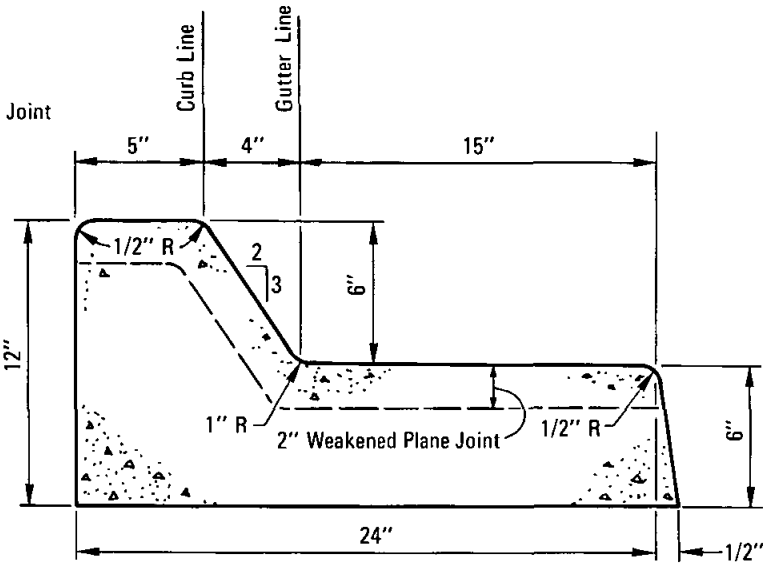
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allard A. Kirchner (signature) Dec. 1975
Coordinator R.C.E. 19807 Date

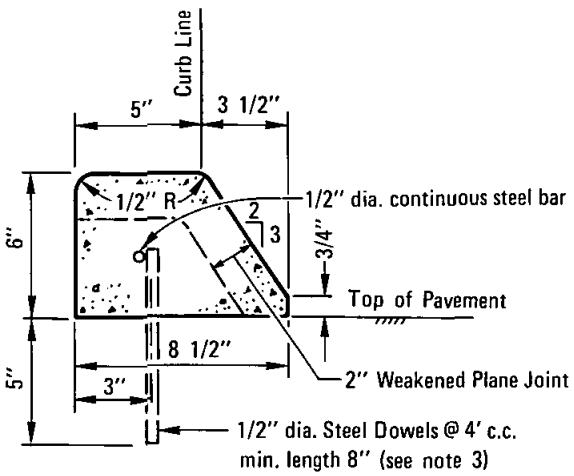
DRAWING NUMBER **G-5**



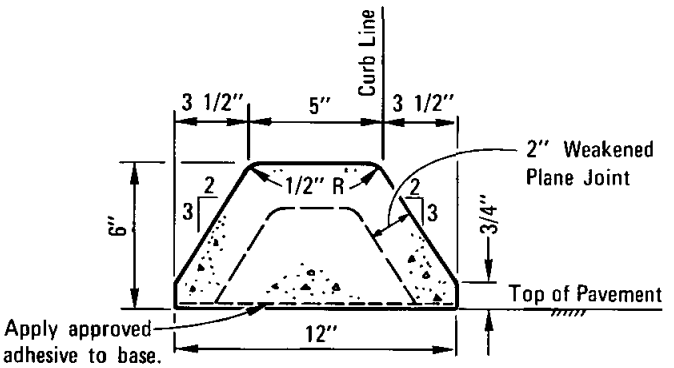
B–1
AREA = 0.79 SQ.FT.



B–2
AREA = 1.29 SQ.FT.



B–3
AREA = 0.29 SQ.FT.



B–4
AREA = 0.35 SQ.FT.

NOTES

1. Concrete shall 517-C-2500.
2. See Standard Drawing G-10 for joint details.
3. Extruded type B-3 curb shall be anchored to existing pavement by placing steel dowels and reinforcing steel as shown or by using an approved adhesive.

LEGEND ON PLANS

Type B-2 Curb and Gutter

Type B-1, B-3, B-4 Curb

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

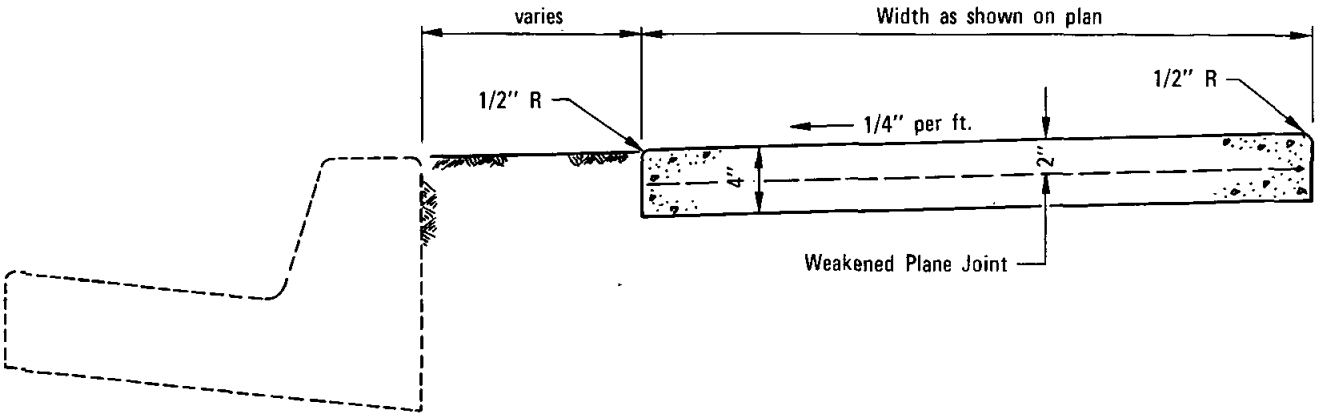
Coordinator R.C.E. 19807 — Date: Dec. 1975

SAN DIEGO REGIONAL STANDARD DRAWING

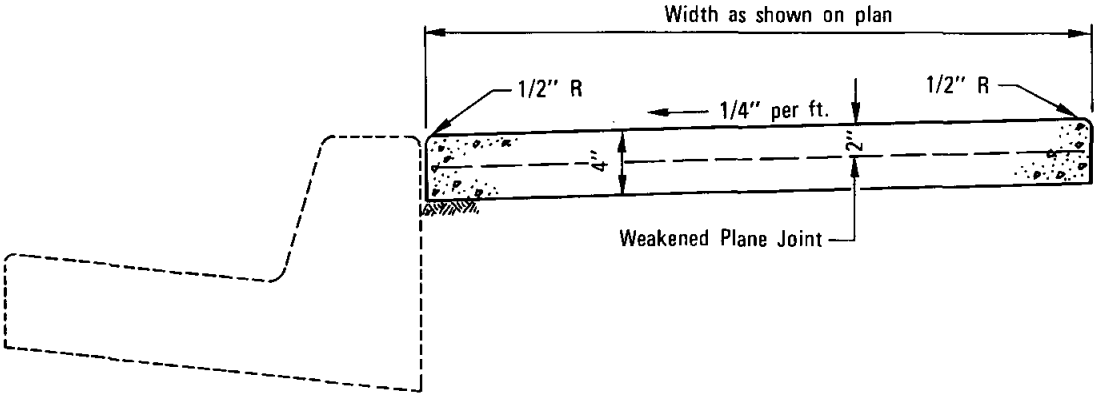
CURBS AND GUTTER - MEDIANS

DRAWING NUMBER G-6

Revision	By	Approved	Date



NON–CONTIGUOUS



CONTIGUOUS

NOTES

1. Concrete shall be 517 - C - 2500.
2. See Standard Drawing G-10 for joint details.

LEGEND ON PLANS

Revision	By	Approved	Date

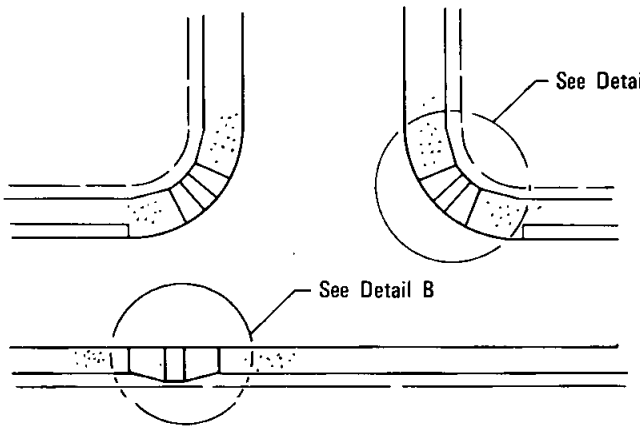
SAN DIEGO REGIONAL STANDARD DRAWING

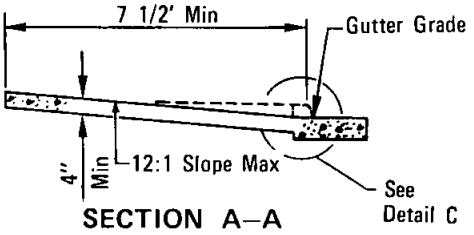
SIDEWALK - TYPICAL SECTIONS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

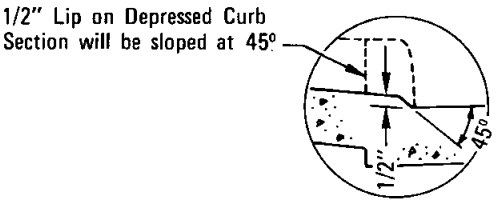
Allan A. Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER G-7

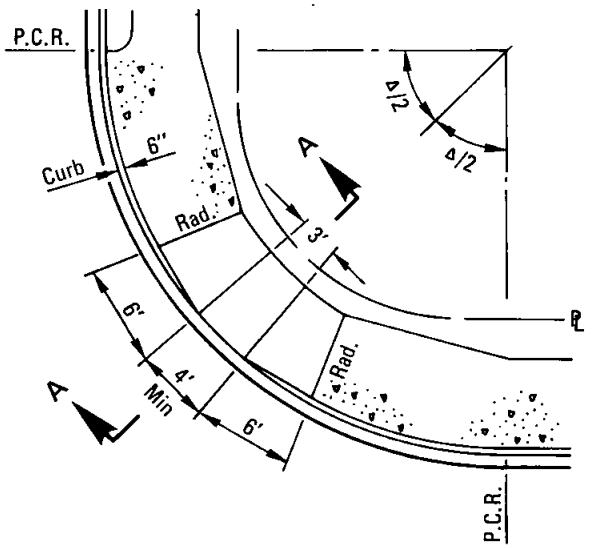




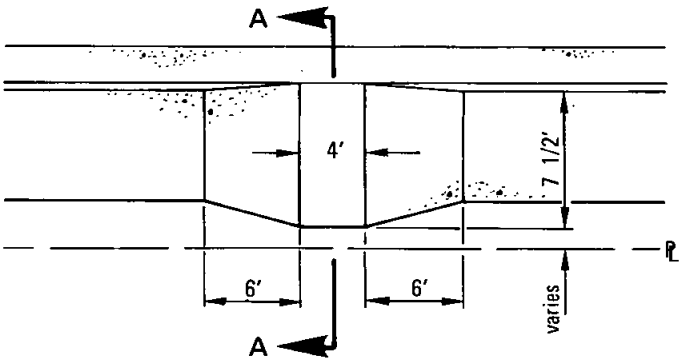
SECTION A–A



DETAIL C



DETAIL–A

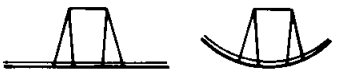


DETAIL–B

NOTES

1. Ramp shall be centered on or directly opposite the bisector of the curb return or as directed by the Agency.
2. In the ramp area, the slope shall not exceed 12:1 (8.33%). Any deviation must be approved by the Agency.
3. Texture to be heavy broom finish transverse to axis of ramp.
4. Concrete shall be 517-C-2500.

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

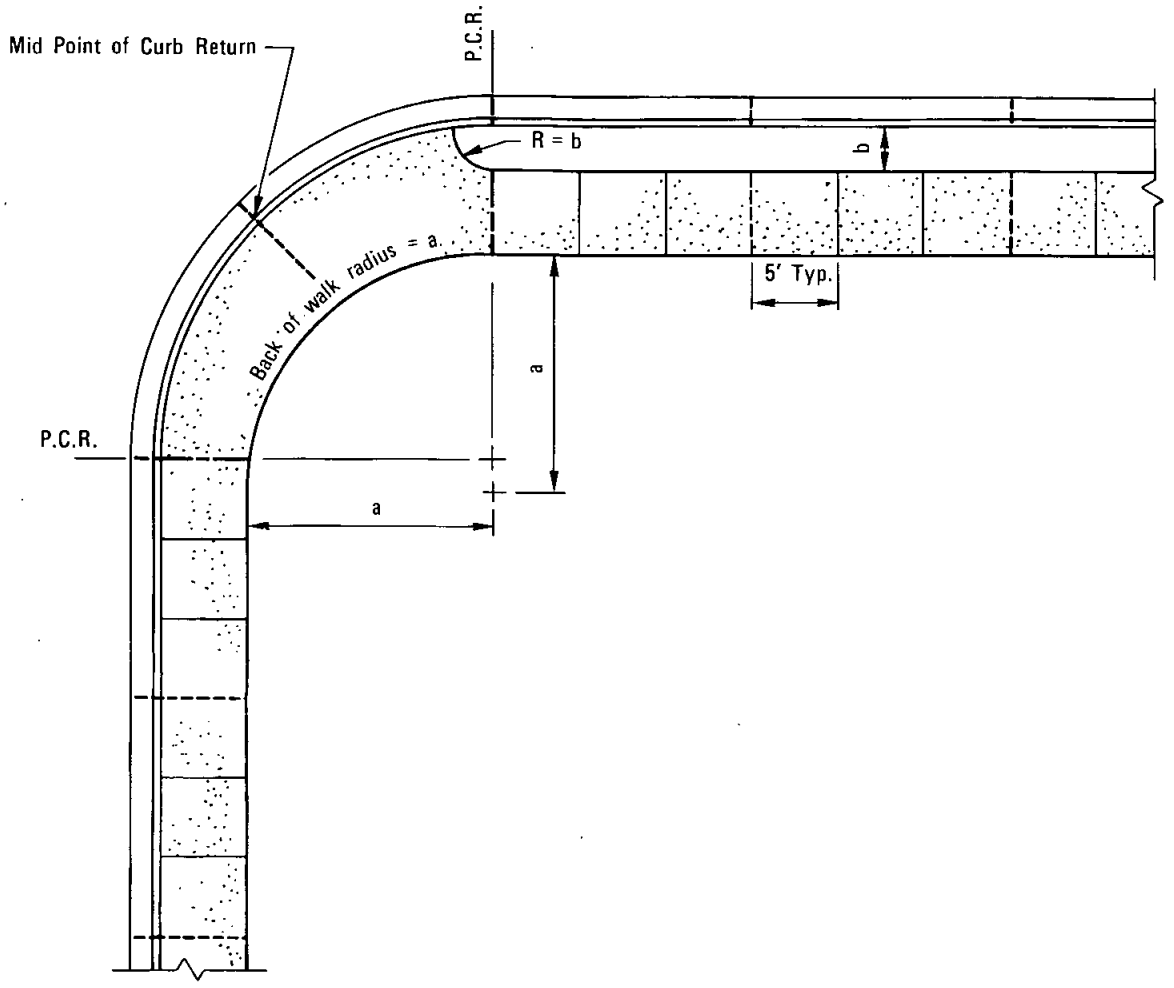
Albert A. Kershaw — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER G-8

SAN DIEGO REGIONAL STANDARD DRAWING

SIDEWALK RAMP

Revision	By	Approved	Date



NOTES

1. Expansion Joints ———— at curb returns, and adjacent to structures. (See Standard Drawing G-10).
2. Weakened Plane Joints - - - - - - - at mid point of curb return, when required, and at 15' intervals from P.C.R.'s (See Standard Drawing G-10).
3. 1/4" grooves ———— with 1/4" radius edges at 5' intervals.
4. See Standard Drawing G-8 for installation of sidewalk ramps.

Revision	By	Approved	Date

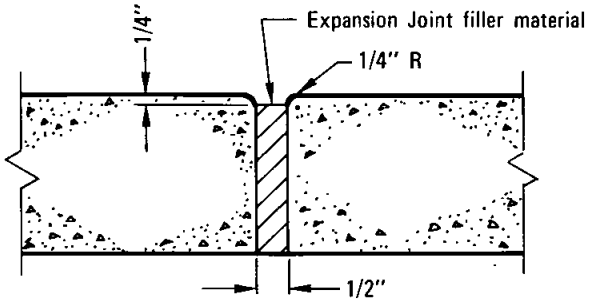
SAN DIEGO REGIONAL STANDARD DRAWING

SIDEWALK JOINT LOCATIONS

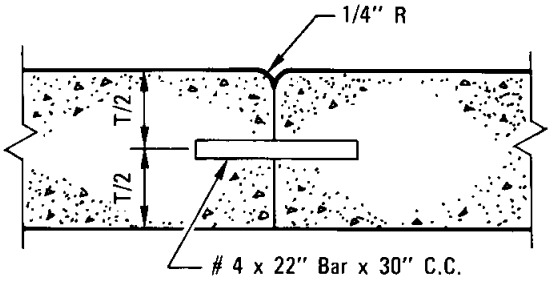
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kershaw — Coordinator R.C.E. 19807 — Dec. 1975 — Date

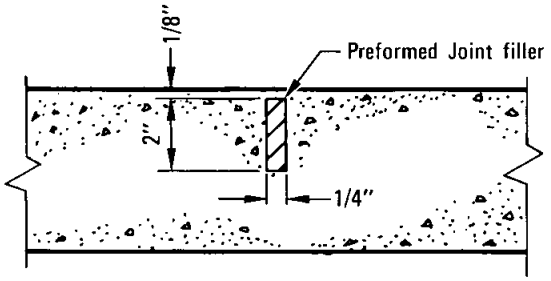
DRAWING NUMBER **G-9**



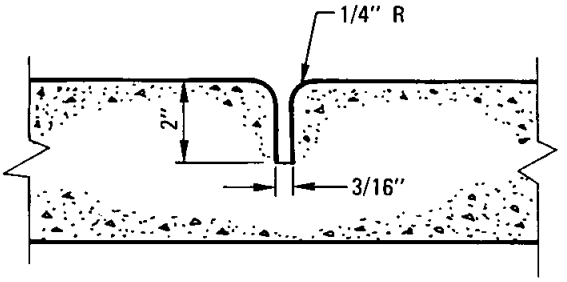
EXPANSION JOINT



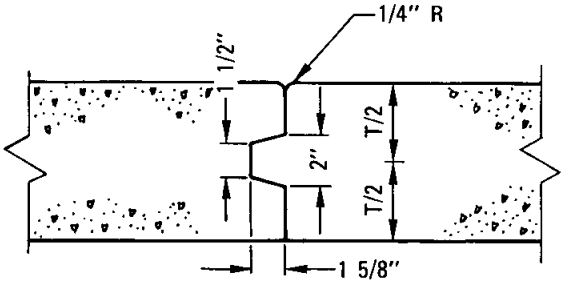
CONTACT JOINT



WEAKENED PLANE JOINT
PAVEMENT



WEAKENED PLANE JOINT
SIDEWALK



KEYED JOINT

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

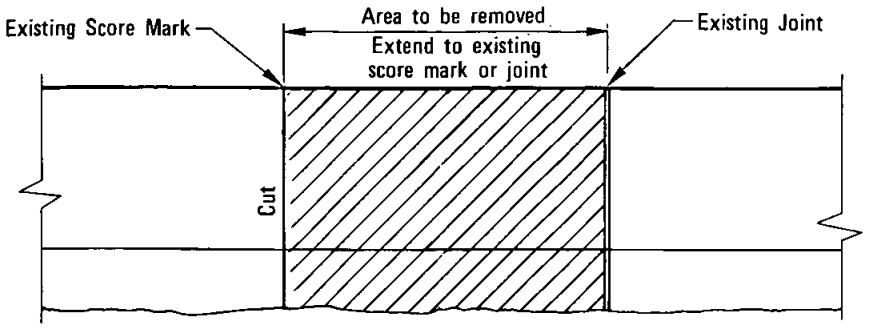
Allen A Kaufman Dec. 1975
Coordinator R.C.E. 19807 Date

DRAWING NUMBER G-10

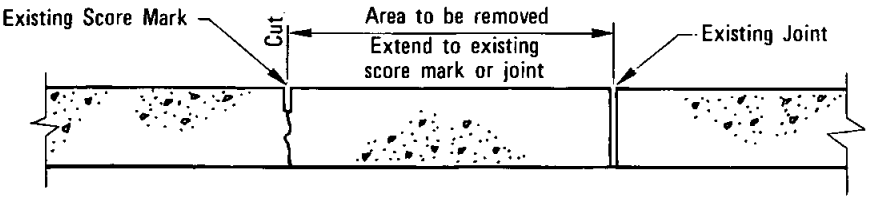
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE JOINT DETAILS

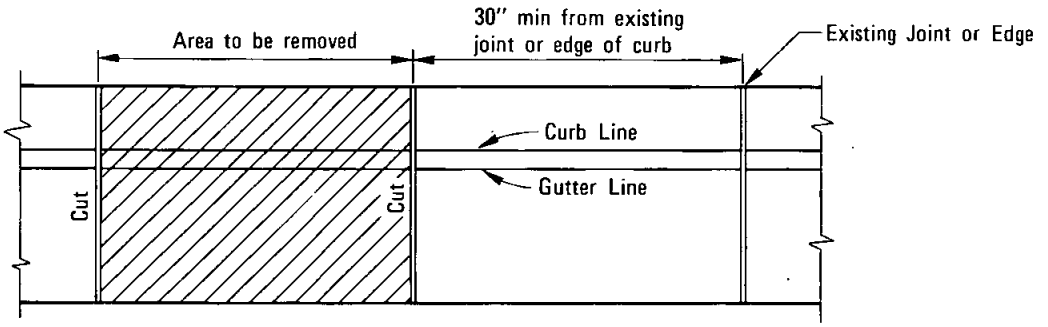
Revision	By	Approved	Date



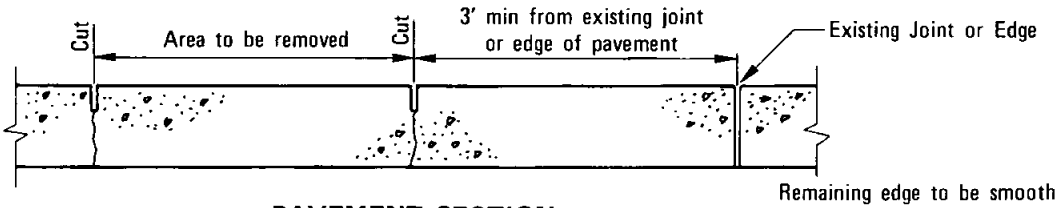
SIDEWALK PLAN



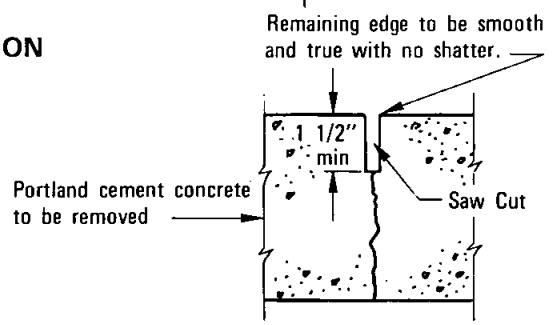
SIDEWALK SECTION



CURB PLAN



PAVEMENT SECTION



SECTION
Showing Cut

NOTE

When distance from, "Area to be removed", to existing joint, edge or score mark is less than minimum shown, "Area to be removed", shall be extended to that joint, edge or score mark.

Revision	By	Approved	Date

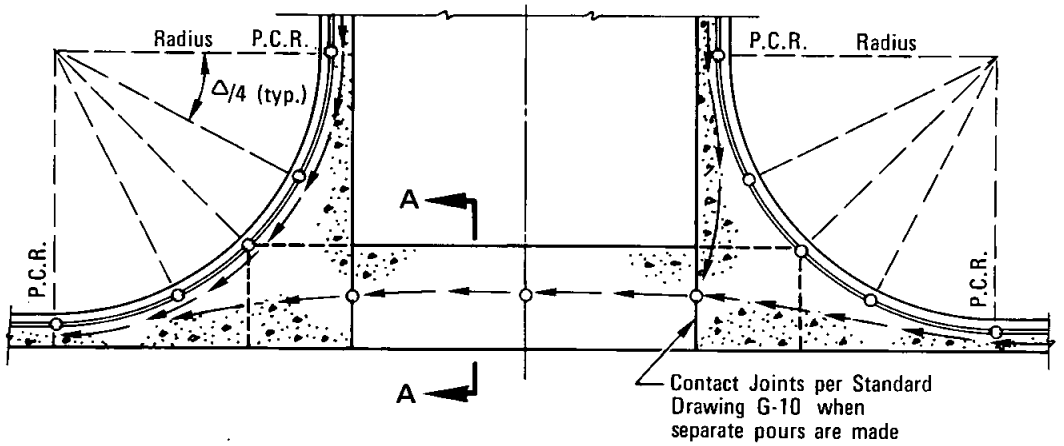
SAN DIEGO REGIONAL STANDARD DRAWING

PORTLAND CEMENT CONCRETE CURB, GUTTER, SIDEWALK AND PAVEMENT REMOVAL AND REPLACEMENT

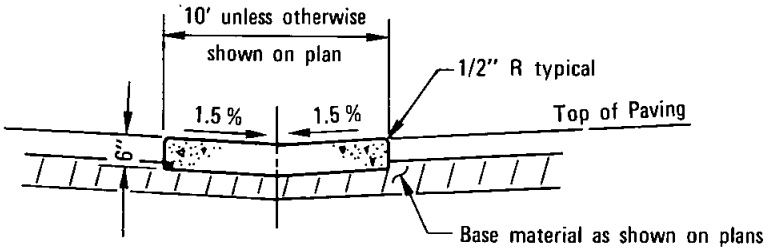
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **G-11**



PLAN

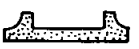


SECTION A–A

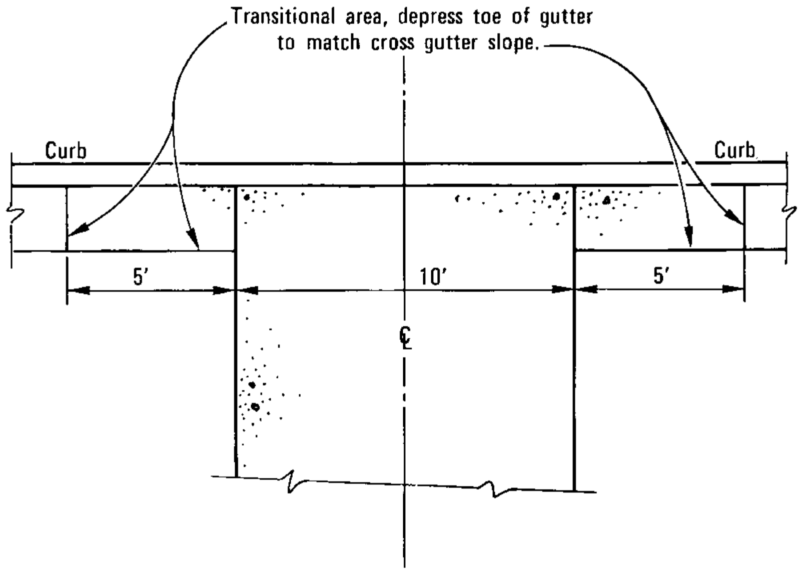
NOTES

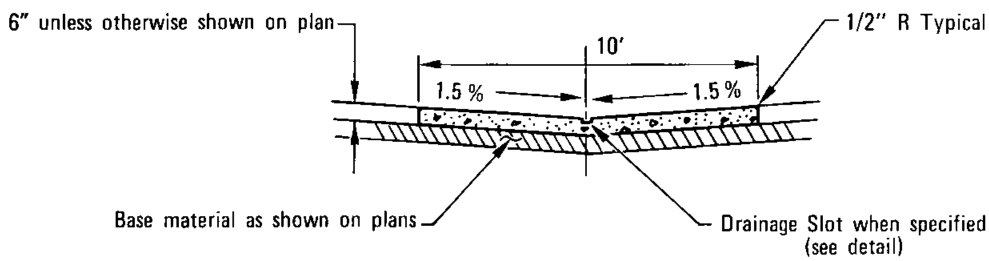
1. Concrete shall be 517 - C - 2500.
2. ---------- = Weakened plane joints.
3. ← ← = Typical flowlines.
4. ○ = Elevations to be shown on plans.
5. Return segments to be 6" thick.

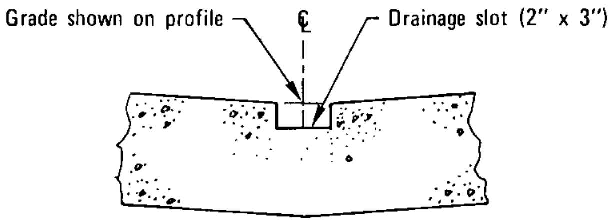
LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
Coordinator R.C.E. 19807 — Date: Dec. 1975					
DRAWING NUMBER G-12	CROSS GUTTER				





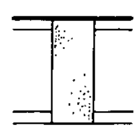


DRAINAGE SLOT DETAIL

NOTES

1. Cross gutter to be constructed where the drainage is carried across street.
2. Minimum allowable cross slope is 0.5 %.
3. Concrete shall be 517 - C - 2500.

LEGEND ON PLANS



Revision	By	Approved	Date

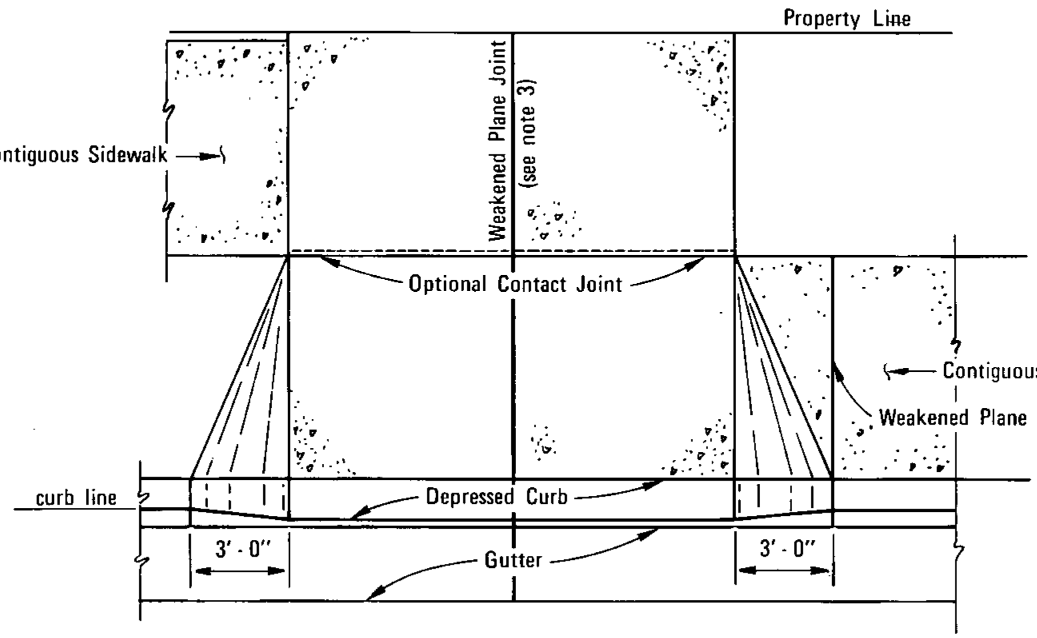
SAN DIEGO REGIONAL STANDARD DRAWING

MID-BLOCK CROSS GUTTER

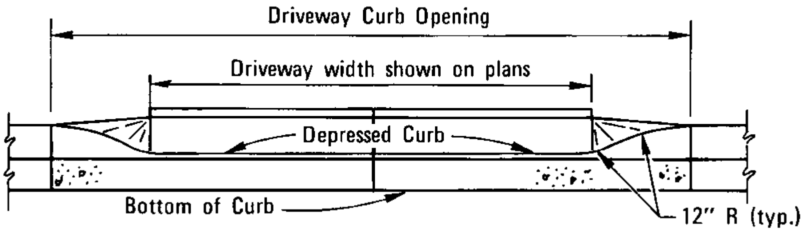
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A. Kerchman — Dec. 1975
Coordinator R.C.E. 19807 — Date

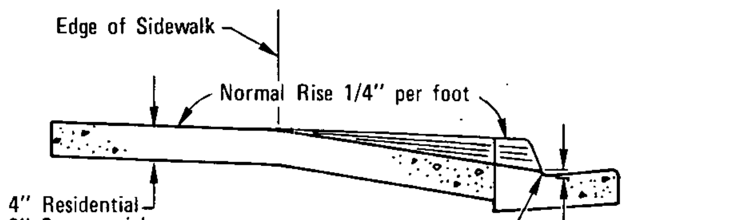
DRAWING NUMBER **G-13**



PLAN



ELEVATION



SECTION

NOTES

1. No concrete shall be placed until forms and subgrade are inspected by the Agency.
2. Concrete shall be 517-C-2500.
3. Weakened plane joints required on driveway ℄ for driveways 12 ft. to 24 ft. wide, driveways wider than 24 ft. to 30 ft. wide shall have two weakened plane joints evenly spaced.
4. See standard drawings G-15 and G-16 for width and location requirements.

LEGEND ON PLANS

℄ of — Residential (Commercial) Driveway

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

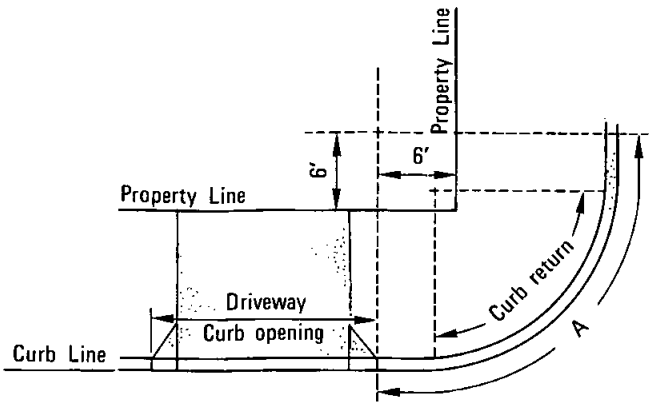
Albert A. Kerchenal (signature) Dec. 1975
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE DRIVEWAYS

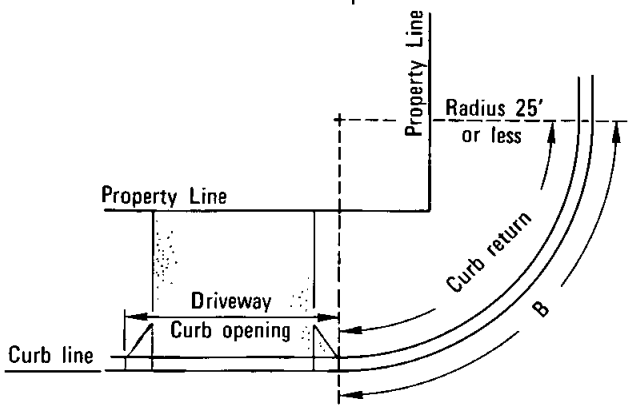
DRAWING NUMBER G-14

Revision	By	Approved	Date



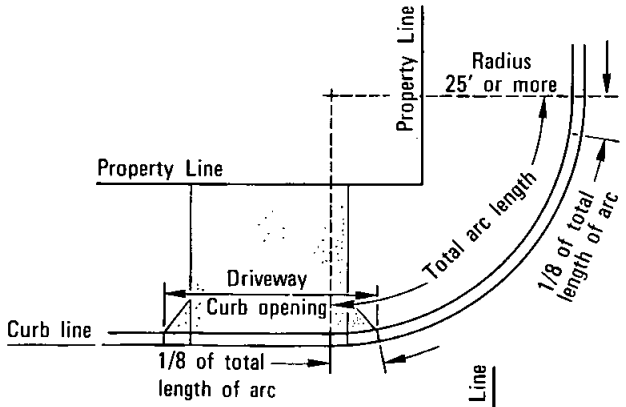
REQUIREMENT 1

No portion of any curb opening shall be permitted within 6' of the intersection of the prolonged property lines and the curb as shown by arc A.



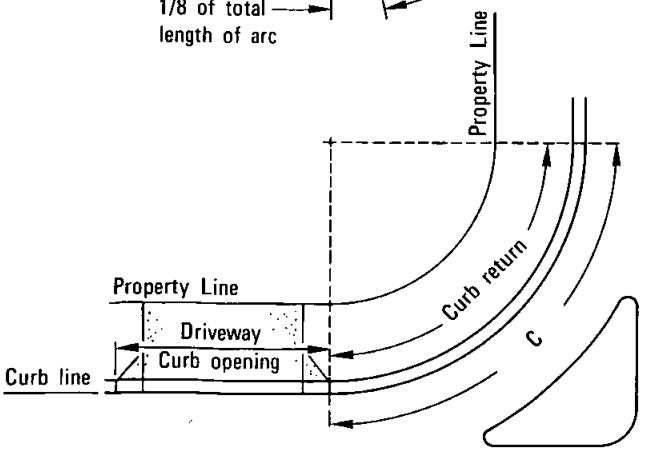
REQUIREMENT 2

No portion of any curb opening shall be permitted in the curb return where the radius of curb is 25' or less, as shown by arc B.



REQUIREMENT 3

On all curb returns where the radius is 25' or more, curb openings may encroach upon each end of the return a distance equal to 12 1/2% or 1/8 of the total length of the arc on the curb return, thus leaving at least 75% of the length of arc on the return face free from driveway encroachment, provided Requirement 1 is met.



REQUIREMENT 4

No portion of any curb opening shall be permitted in the curb return where a seperate turning movement is provided, as shown by arc C

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

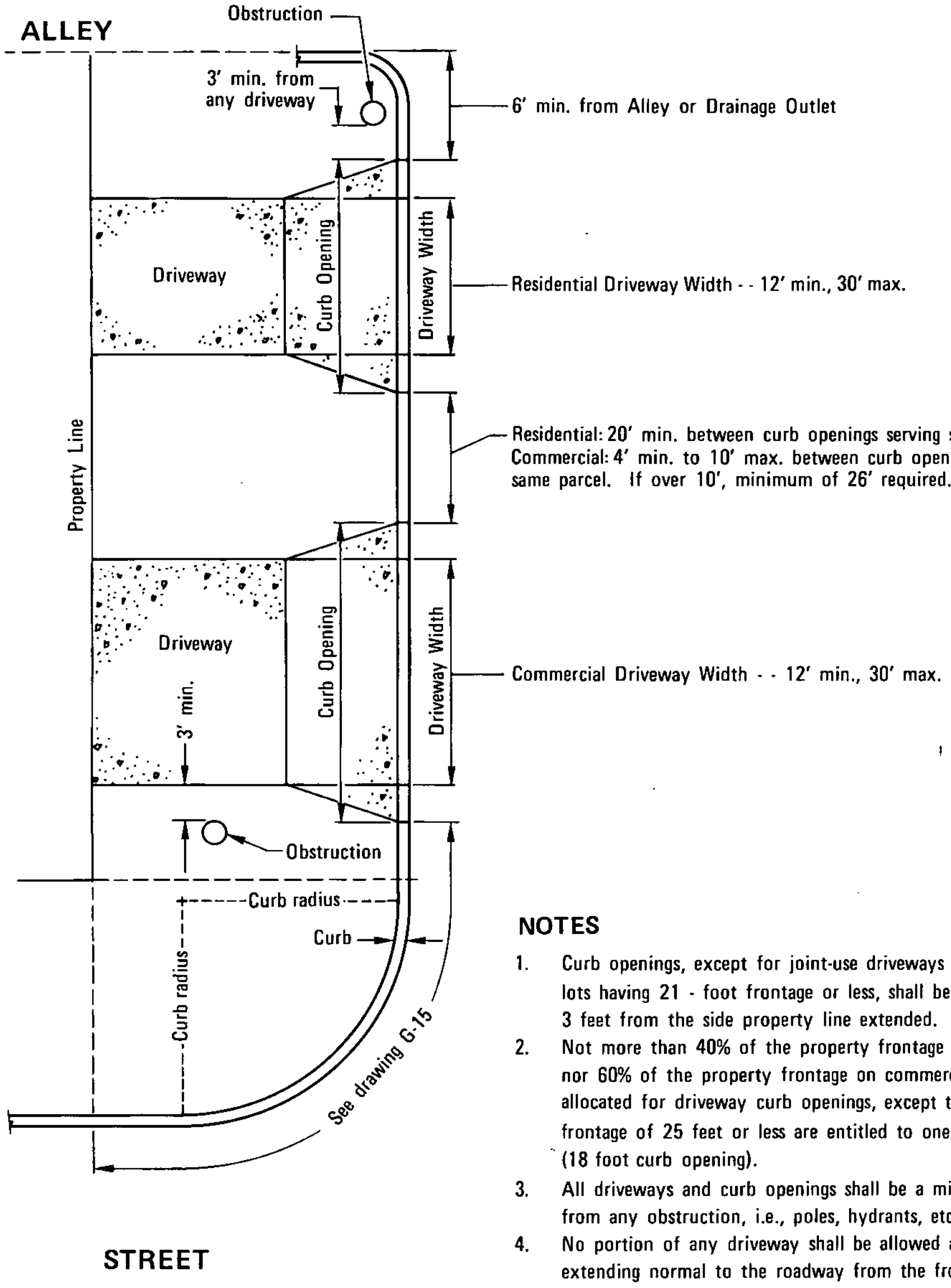
DRIVEWAY LOCATION - ADJACENT TO CURB RETURNS AND STREET LINES

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kuchenal — Coordinator R.C.E. 19807

Dec. 1975 — Date

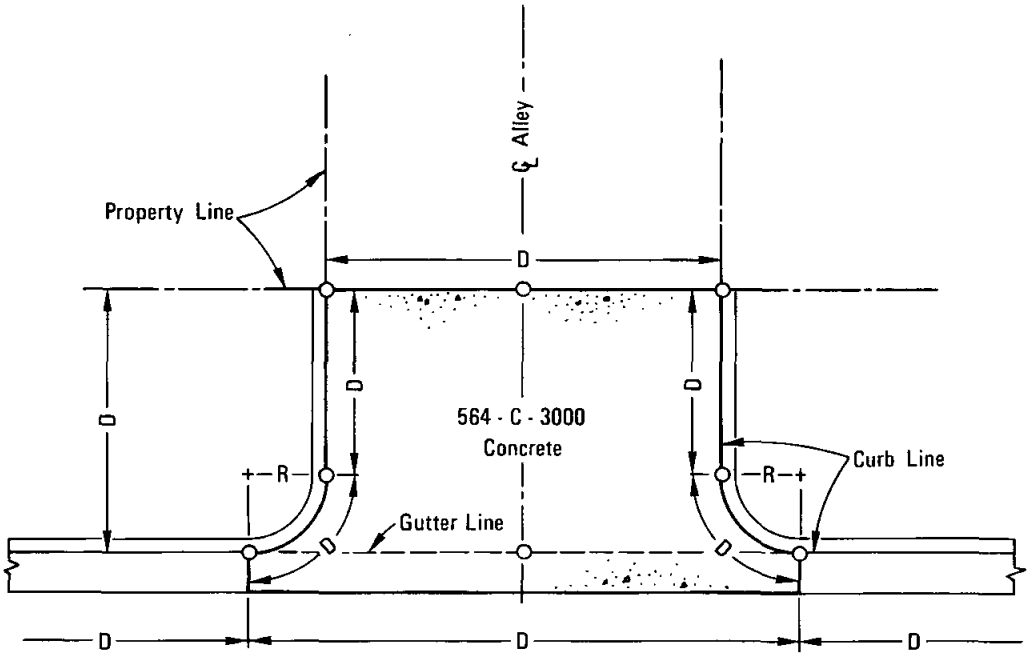
DRAWING NUMBER **G-15**



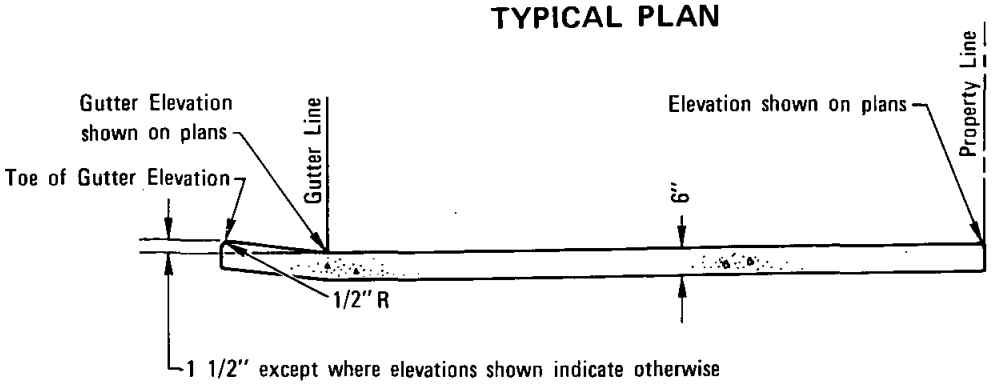
NOTES

1. Curb openings, except for joint-use driveways and drive ways on lots having 21 - foot frontage or less, shall be located at least 3 feet from the side property line extended.
2. Not more than 40% of the property frontage on residential lots, nor 60% of the property frontage on commercial lots may be allocated for driveway curb openings, except that lots having frontage of 25 feet or less are entitled to one 12 foot driveway (18 foot curb opening).
3. All driveways and curb openings shall be a minimum of 3 feet from any obstruction, i.e., poles, hydrants, etc.
4. No portion of any driveway shall be allowed across a line extending normal to the roadway from the front corner of the property, except that joint-use driveways may be permitted in special instances where written approval of both property owners is filed with the Agency.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
[signature] Dec. 1975 Coordinator R.C.E. 19807 Date	DRIVEWAY LOCATION AND WIDTH REQUIREMENTS				
DRAWING NUMBER G-16					



TYPICAL PLAN



℄ SECTION

NOTES

1. Sidewalk Ramps shall be installed as required by Agency.
2. D = distance shown on plans.
3. R = radius shown on plans (3 ft. minimum).
4. O = elevations shown on plans (top of curb, and gutter elev.).

LEGEND ON PLANS

Revision	By	Approved	Date

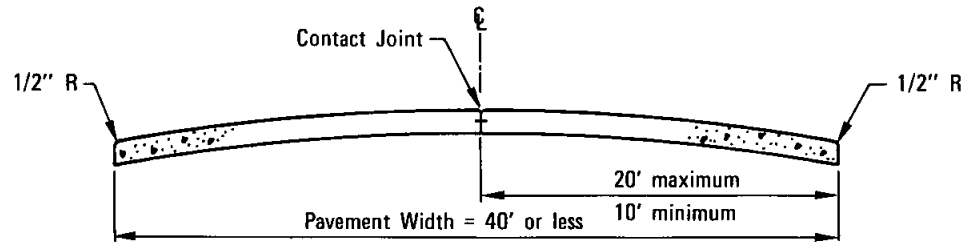
SAN DIEGO REGIONAL STANDARD DRAWING

ALLEY APRON

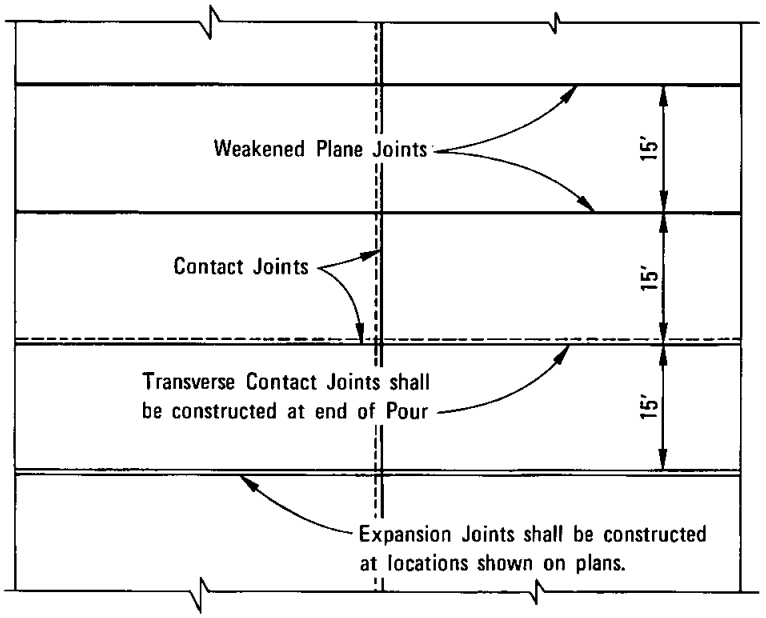
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan J. Kuchenal — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **G-17**



TYPICAL SECTION

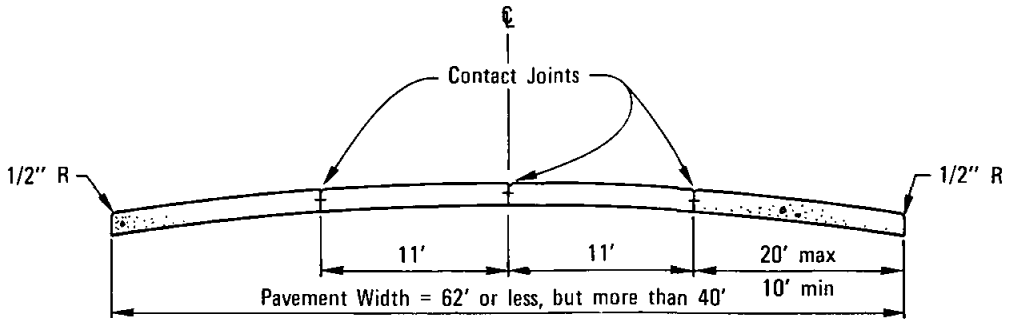


TYPICAL PLAN

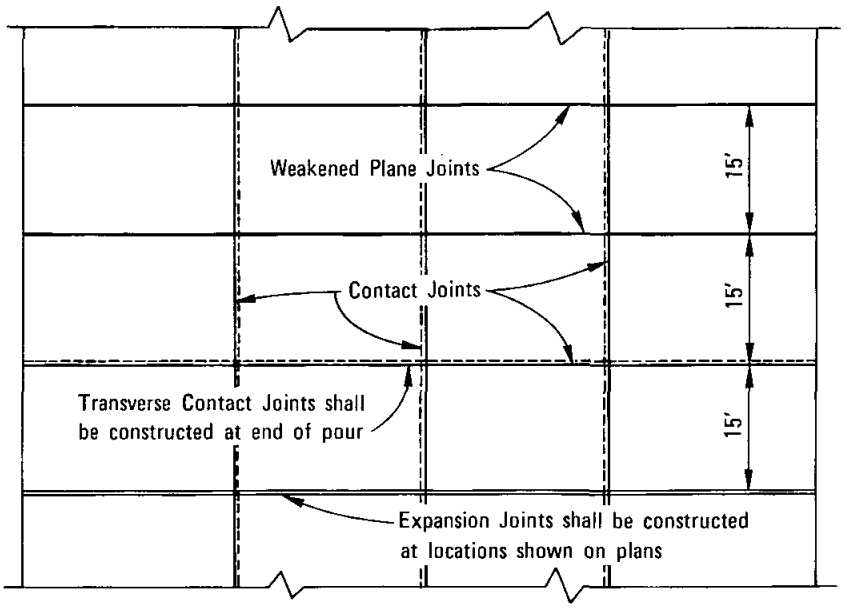
NOTES

1. Concrete shall be 564 - C - 3000.
2. See Standard Drawing G-10 for Joint Details.
3. Adjust 15' interval between Transverse Joints to match adjacent existing improvements.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
Allen A Kenkel Dec. 1975 Coordinator R.C.E. 19807 Date	**CONCRETE PAVEMENT, WIDTH 40' OR LESS**				
DRAWING NUMBER **G-18**					



TYPICAL SECTION



TYPICAL PLAN

NOTES

1. Concrete shall be 564 - C - 3000.
2. See Standard Drawing G-10 for joint details.
3. Adjust 15' interval between Transverse Joints to match adjacent existing improvements.

Revision	By	Approved	Date

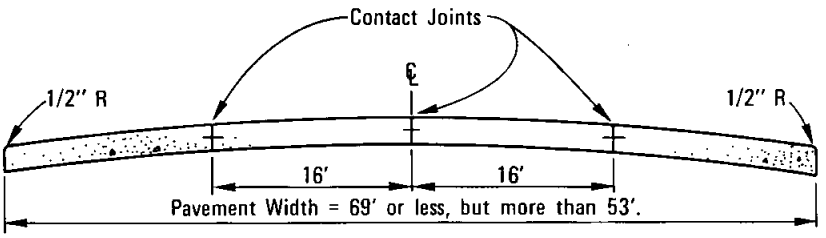
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE PAVEMENT, WIDTH 40' TO 62'

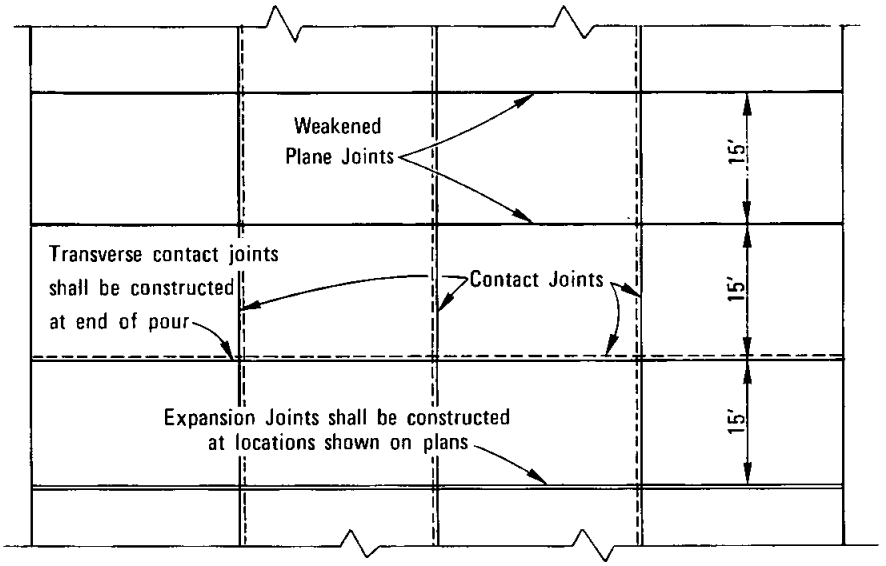
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A. Kercheval — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER G-19



TYPICAL SECTION

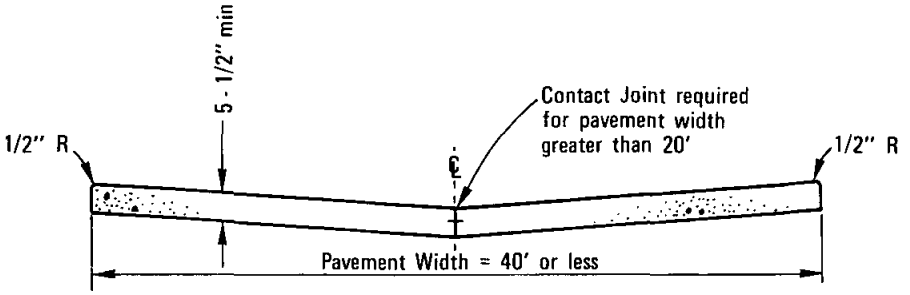


TYPICAL PLAN

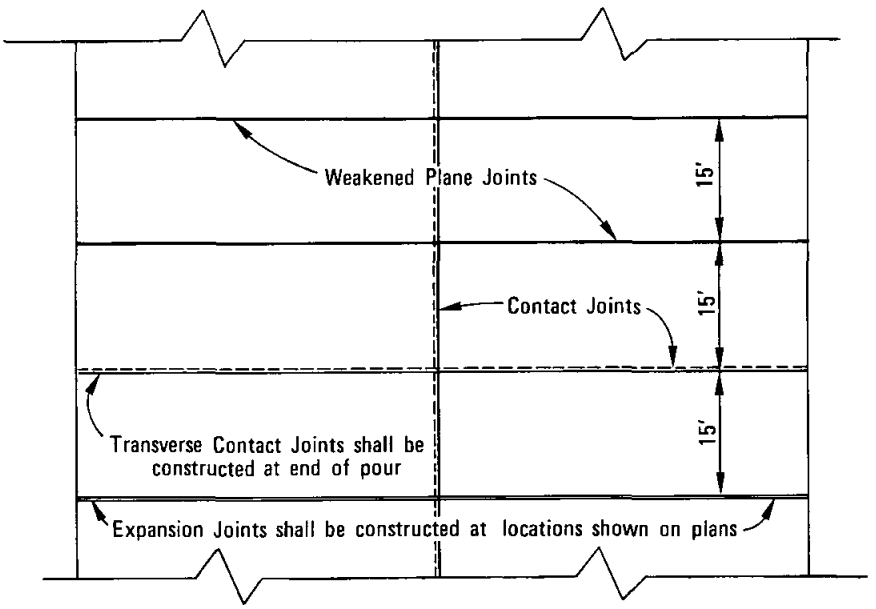
NOTES

1. Concrete shall be 564 - C - 3000.
2. See Standard Drawing G-10 for Joint Details.
3. Adjust 15' interval between Transverse Joints to match adjacent existing improvements.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE Allan A Kenkel Dec. 1975 Coordinator R.C.E. 19807 Date	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
DRAWING NUMBER G-20	**CONCRETE PAVEMENT, WIDTH 53' TO 69'**				



TYPICAL SECTION



TYPICAL PLAN

NOTES

1. Concrete shall be 564 - C - 3000.
2. See Standard Drawing G-10 for joint details.
3. Adjust 15' interval between Transverse Joints to match adjacent existing improvements.

Revision	By	Approved	Date

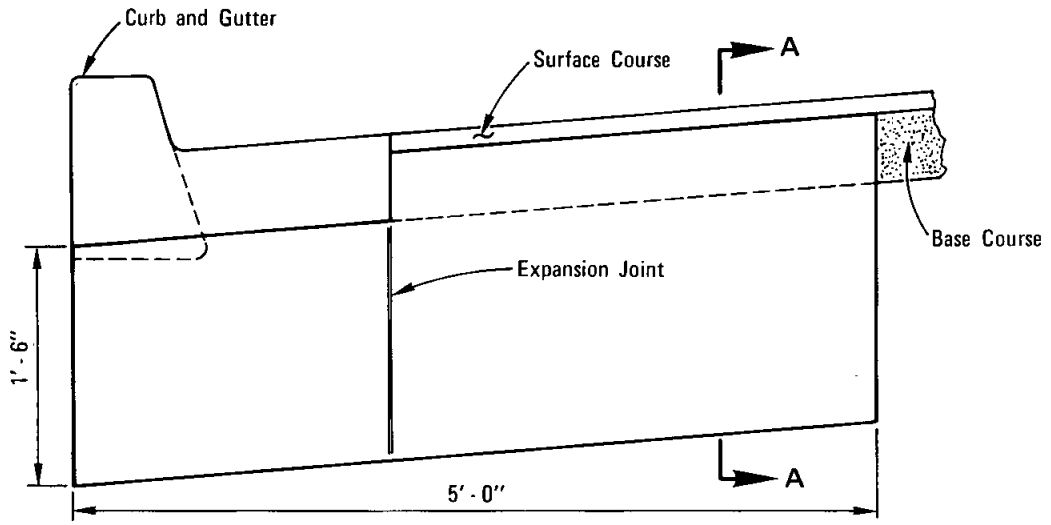
SAN DIEGO REGIONAL STANDARD DRAWING

CONCRETE PAVEMENT, ALLEY SECTION, WIDTH 40' OR LESS

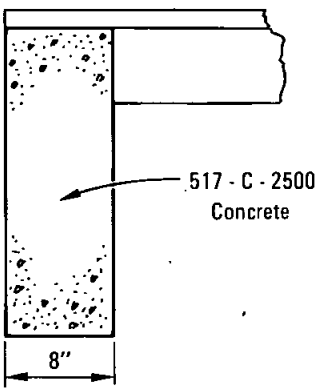
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A. Kershaw — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER G-21

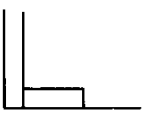


ELEVATION



SECTION A–A

LEGEND ON PLANS



RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

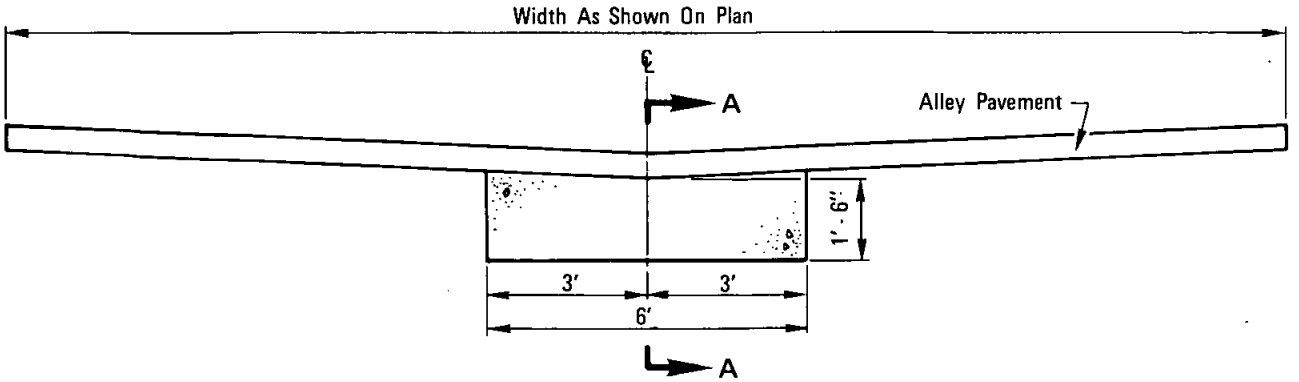
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER G-22

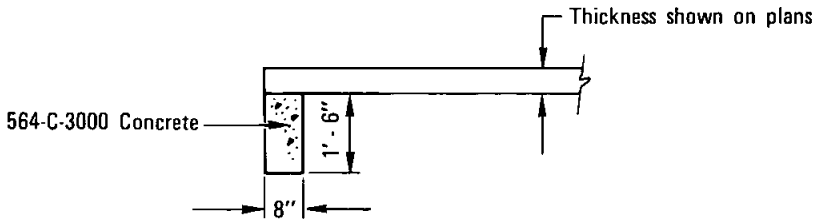
SAN DIEGO REGIONAL STANDARD DRAWING

CUTOFF WALL AT END OF PAVEMENT

Revision	By	Approved	Date



ELEVATION



SECTION A–A

LEGEND ON PLANS

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

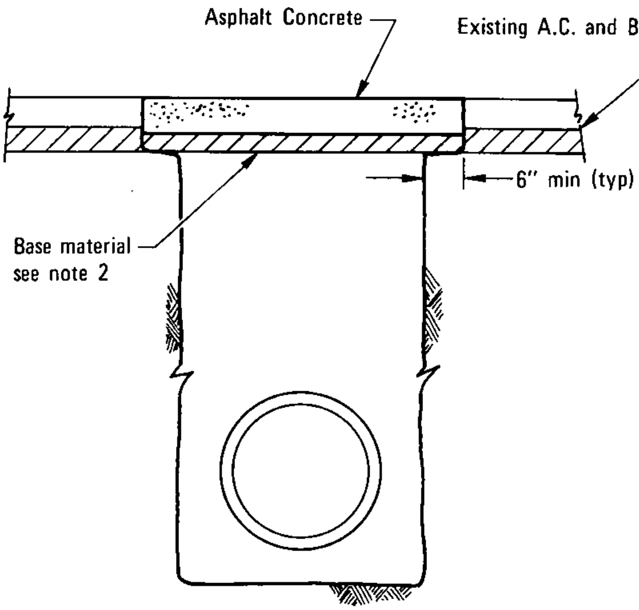
CUTOFF WALL AT END OF ALLEY PAVEMENT

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

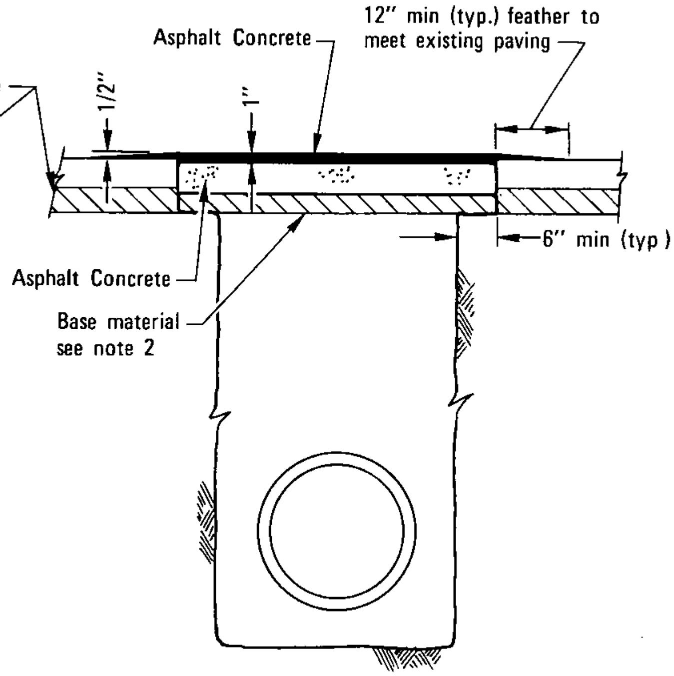
Allen A Kenkel — Dec. 1975

Coordinator R.C.E. 19807 — Date

DRAWING NUMBER G-23



TYPE A



TYPE B

NOTES

1. Existing A.C. shall be cut and removed in such a manner so as not to tear, bulge or displace adjacent pavement. Edges shall be clean and vertical. All cuts shall be parallel or perpendicualr to street centerline, when practical.
2. Base material to be replaced to depth of existing base. A.C. may be substituted for base material.
3. A tack coat of asphaltic emulsion or paving asphalt shall be applied to existing A.C. at all contact surfaces, prior to resurfacing.
4. Asphaltic Concrete Resurfacing:
   a) Minimum total thickness shall be one inch greater than exisitng A.C.
   b) A.C. shall be hot plant mix.
   c) Finish course for Type B resurfacing shall be laid down using a spreader box.
5. All A.C. resurfacing shall be seal coated with an emulsified asphalt and covered with sand. Chip sealing shall be applied as required by Agency.
6. Type B not to be used on lateral crossings.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

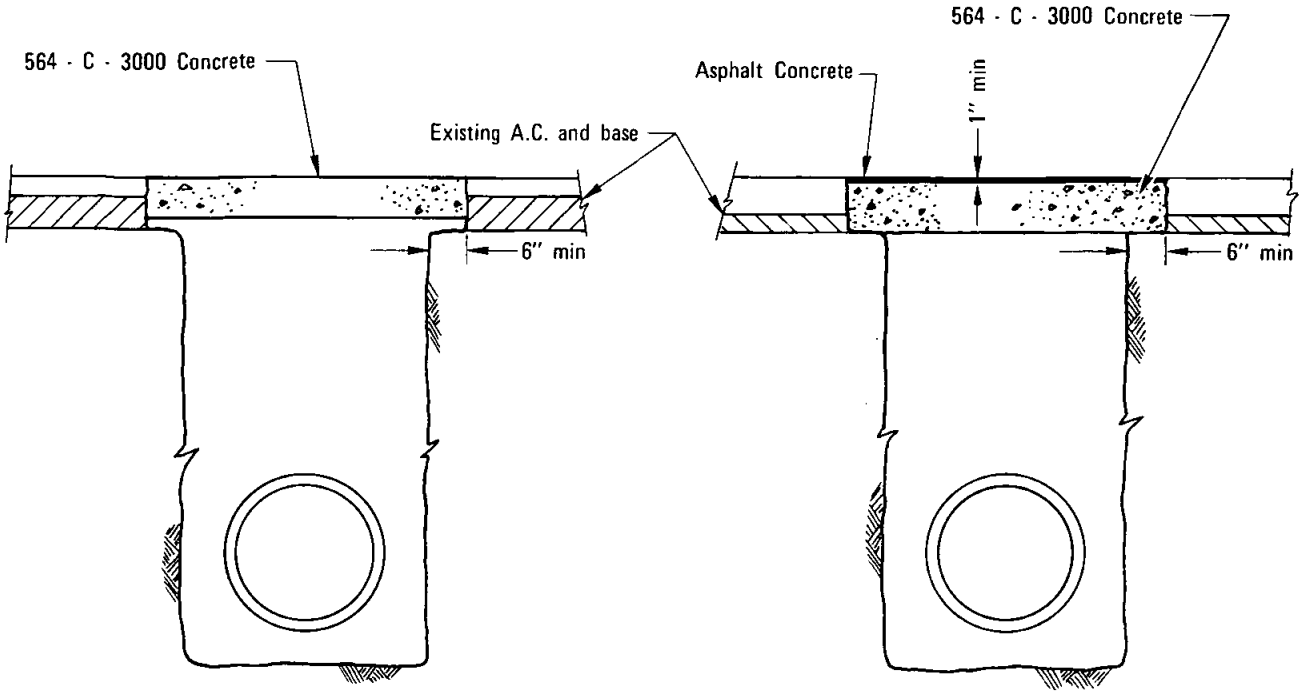
Allan A Kuchenal Dec. 1975
Coordinator R.C.E. 19807 Date

SAN DIEGO REGIONAL STANDARD DRAWING

TRENCH RESURFACING TYPES A & B

DRAWING NUMBER **G-24**

Revision	By	Approved	Date



TYPE–C

TYPE–D

GENERAL NOTES

1. Existing A.C. shall be cut and removed in such a manner so as not to tear, bulge or displace adjacent pavement. Edges shall be clean and vertical. All cuts shall be parallel or perpendicular to street centerline, when practical.

NOTES TYPE–C

1. Concrete shall be colored black. Method to be specified by Agency.
2. Minimum concrete thickness:
   - Alleys and local residential streets ---------- 5 inches
   - Major streets and highways ---------- 7 inches

NOTES TYPE–D

1. A.C. shall be hot plant mix.
2. A tack coat of asphaltic emulsion or paving asphalt shall be applied to the existing A.C. at all contact surfaces and to the portland concrete prior to placing the new A.C.
3. A.C. resurfacing shall be seal coated with an emulsified asphalt and covered with sand. Chip sealing shall be applied as required by Agency.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

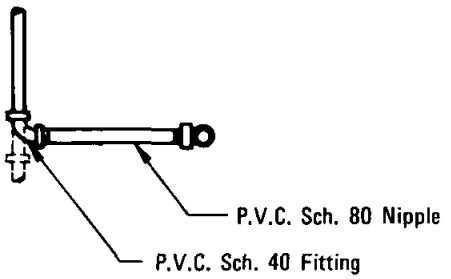
TRENCH RESURFACING TYPES C & D

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

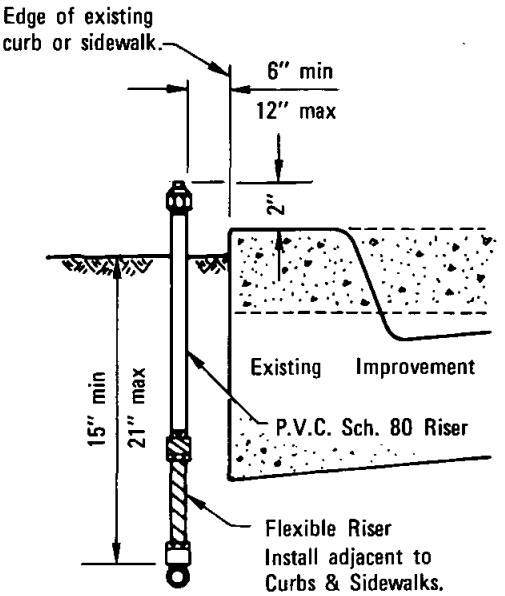
Allan A Kenchmark — Coordinator R.C.E. 19807 — Dec. 1975 — Date

DRAWING NUMBER G-25

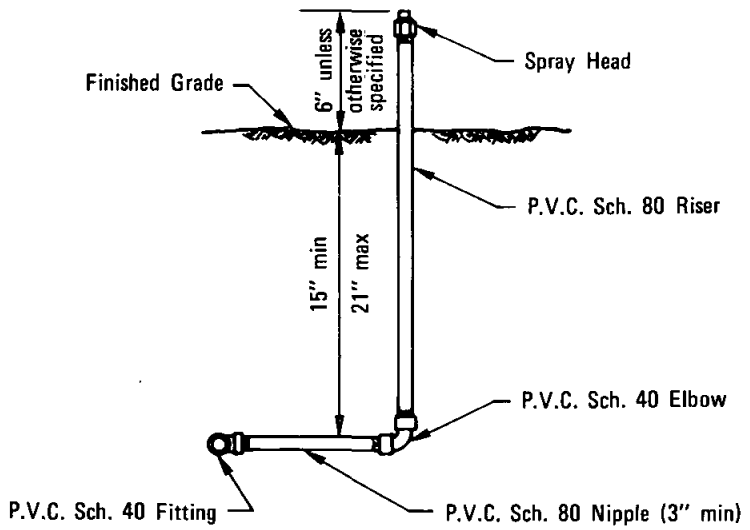
SPRINKLER IRRIGATION SYSTEMS



PLAN VIEW



LOCATION OF SPRINKLER HEADS ADJACENT TO EXISTING IMPROVEMENTS



ELEVATION

NOTES

1. Teflon tape, 3/4" wide, shall be used on all threaded connections.
2. Close nipples shall not be used.

LEGEND ON PLANS

Show a number to indicate type head.

Revision	By	Approved	Date

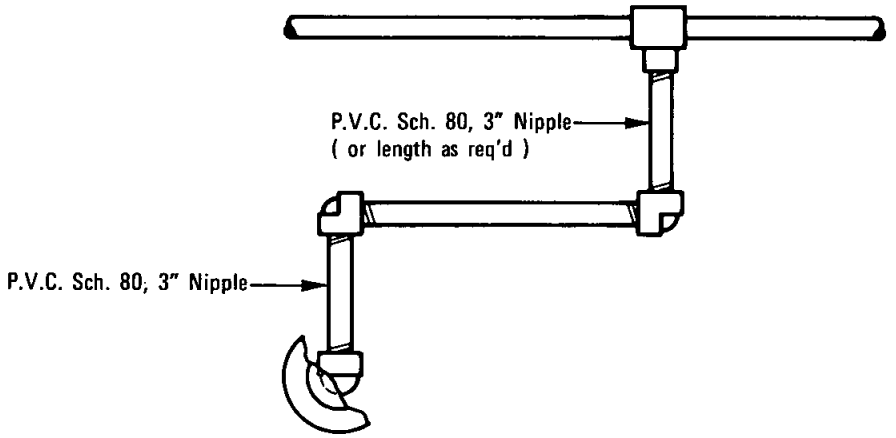
SAN DIEGO REGIONAL STANDARD DRAWING

SHRUBBERY SPRINKLER HEAD FIXED SPRAY TYPE

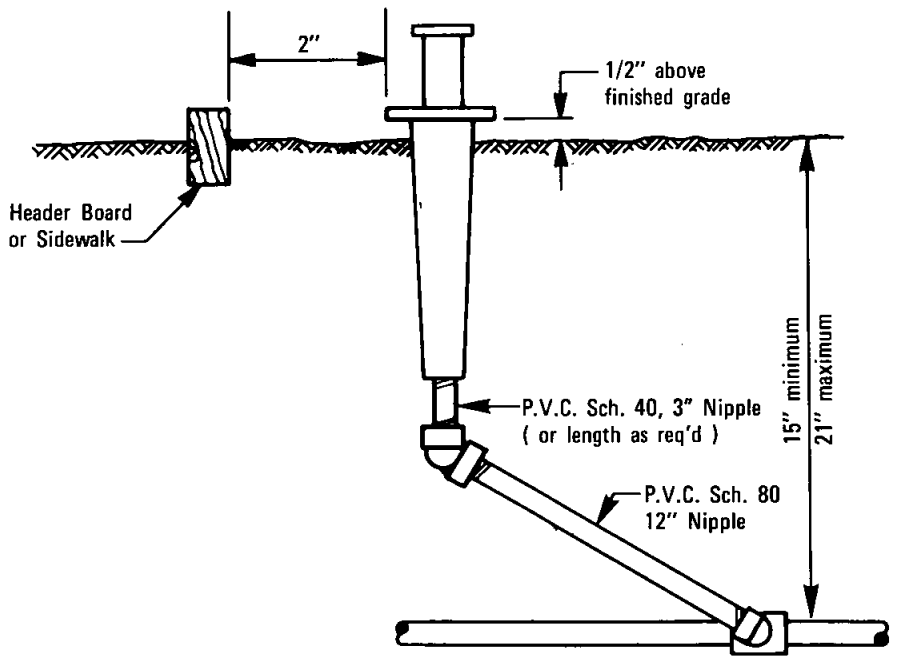
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER I-1



PLAN



ELEVATION

NOTES

1. All fittings shall be P.V.C. Sch. 40.
2. Teflon tape, 3/4" wide, shall be used on all threaded connections.
3. Short nipples shall not be used.

LEGEND ON PLANS

Show a number to indicate type head ○

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

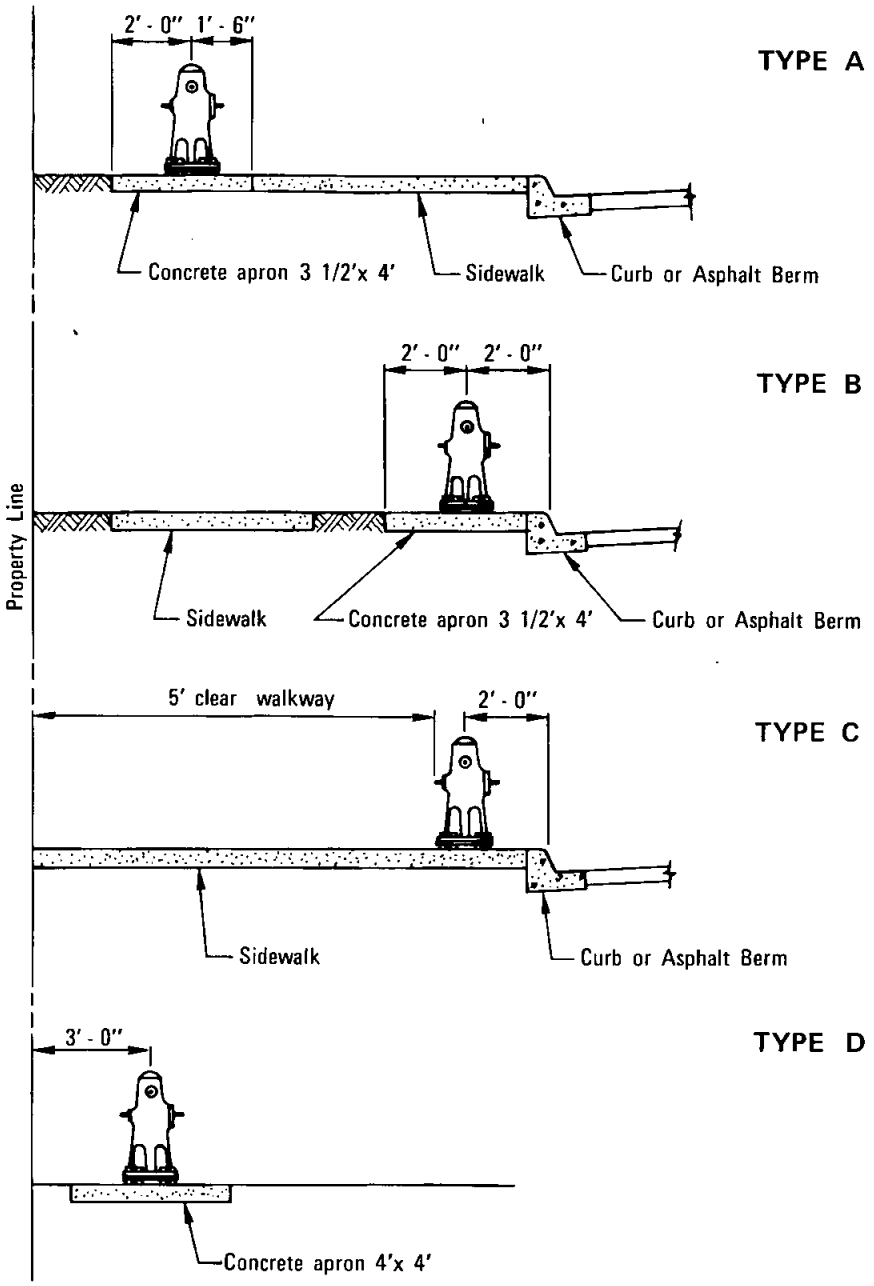
Allan A. Kershaw — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER I-2

SAN DIEGO REGIONAL STANDARD DRAWING

LAWN SPRINKLER HEAD
POP UP SPRAY TYPE

Revision	By	Approved	Date



NOTES:

1. Apron, where required by Agency, shall be 4" thick (470-C-2000) concrete.
2. When distance from hydrant to the top or toe of slope is less than 2' - 0", special hydrant installation will be required by Agency.
3. Where hydrant is not protected by a vertical face curb protective posts are required. See Standard Drawing W-16 for details.
4. Hydrant shall be located 5' from curb return, 3' min from driveway, on property line extension, or as shown on plans.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

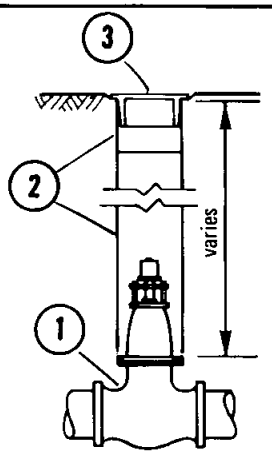
FIRE HYDRANT LOCATIONS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenchmark — Coordinator R.C.E. 19807

Dec. 1975 — Date

DRAWING NUMBER **W-11**

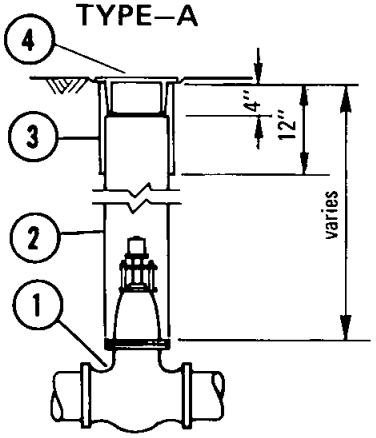


TYPE–A

1. Valve
2. 8" Asbestos Cement Pipe, Class 150
3. 8" Valve Well Cap with 4" Skirt

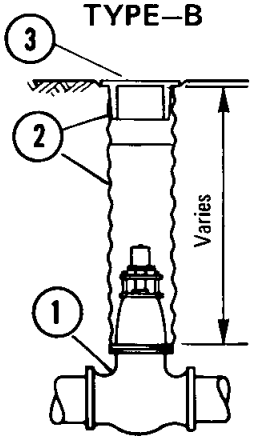
NOTES

1. Provide clamp or felt to hold pipe sections (item 2) together during backfill.
2. Pipe shall be saw or machine cut on each end, no beveled sections will be permitted.
3. The final adjustment to finish grade may be made with an asbestos cement ring of 1" minimum height.



TYPE–B

1. Valve
2. 8" O.D. Steel Pipe, or 10 Ga. Asphalt Coated and Lined.
3. 8 5/8" O.D. Steel Pipe or 10 Ga. Asphalt Coated and Lined.
4. 8" Valve Well Cap with 4" Skirt



TYPE–C

1. Valve
2. 8" Corrugated Steel Pipe, 16 Gage
3. 8" Valve Well Cap with 4" Skirt

NOTE

Pipe sections shall be tack welded together.

GENERAL NOTES

1. Clearance around cover shall permit lifting by hand without damage to pipe. Maximum clearance shall be 3/16".
2. See Standard Drawing W-13 for valve stem extension, when required by Agency.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

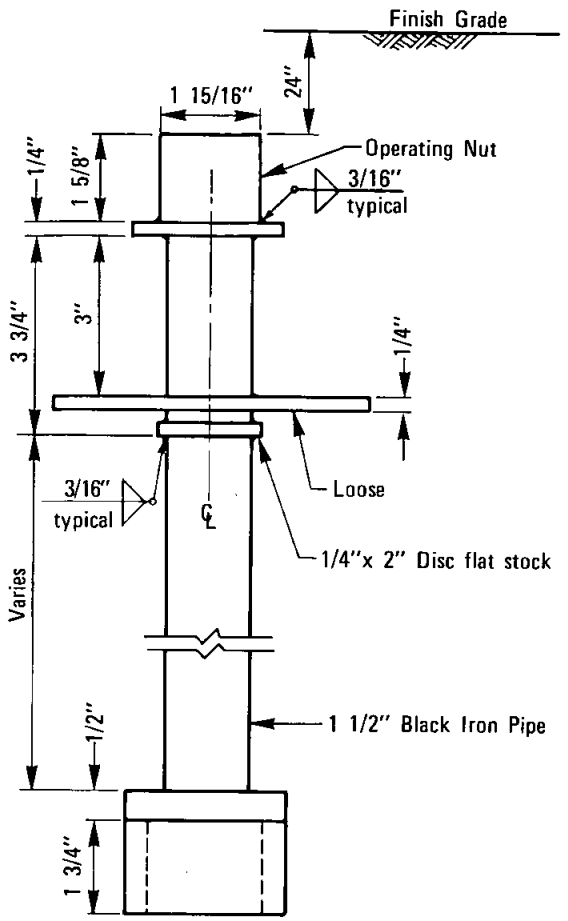
Allen O Kenkel — Coordinator R.C.E. 19807 — Dec. 1975 Date

DRAWING NUMBER **W-12**

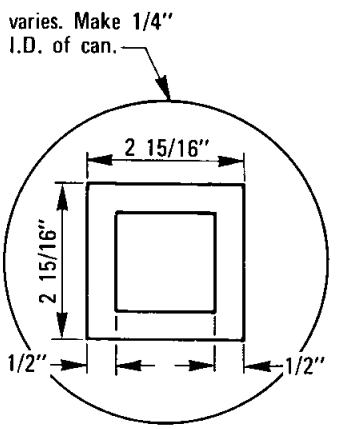
SAN DIEGO REGIONAL STANDARD DRAWING

VALVE WELL INSTALLATION

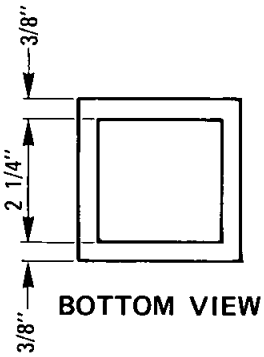
Revision	By	Approved	Date



ELEVATION



TOP VIEW



BOTTOM VIEW

NOTES

1. Extension to be used when top of valve nut is 5' or more below finish grade.
2. Paint all finished surfaces with asphalt varnish.

Revision	By	Approved	Date

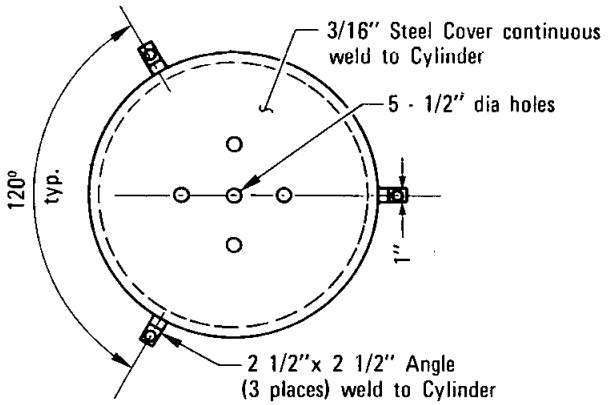
SAN DIEGO REGIONAL STANDARD DRAWING

VALVE STEM EXTENSION

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

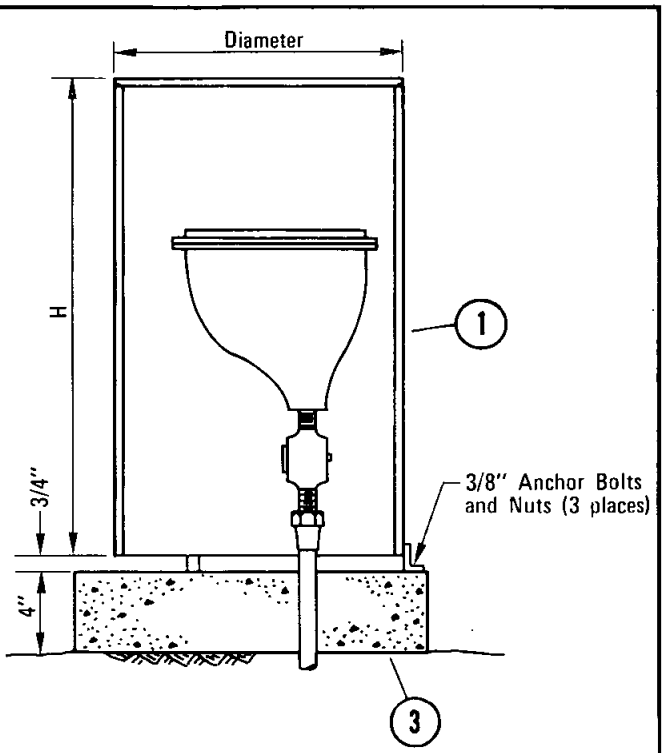
Coordinator R.C.E. 19807 — Date: Dec. 1975

DRAWING NUMBER **W-13**

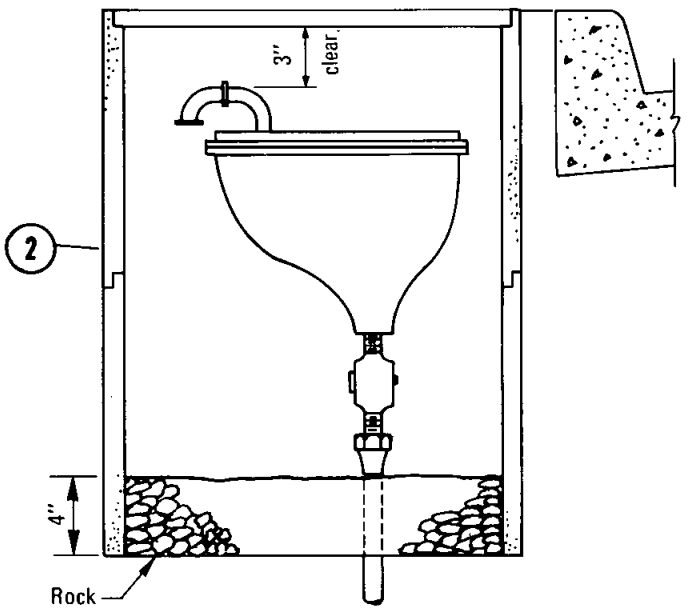


PLAN

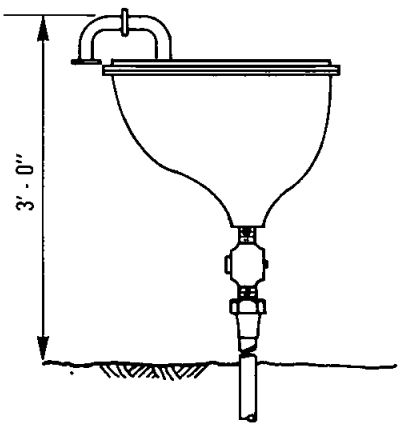
Valve Size	Dia	H
1" & 2"	14"	24"
4"	14"	30"
6"	16"	36"



TYPE A



TYPE B



TYPE C

(1) Steel enclosure, paint as specified by Agency.

(2) Meter box, see Standard Drawing W-15 for location.

(3) 2' x 2' pad, 470 - C - 2000 Concrete

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenchmark Dec. 1975

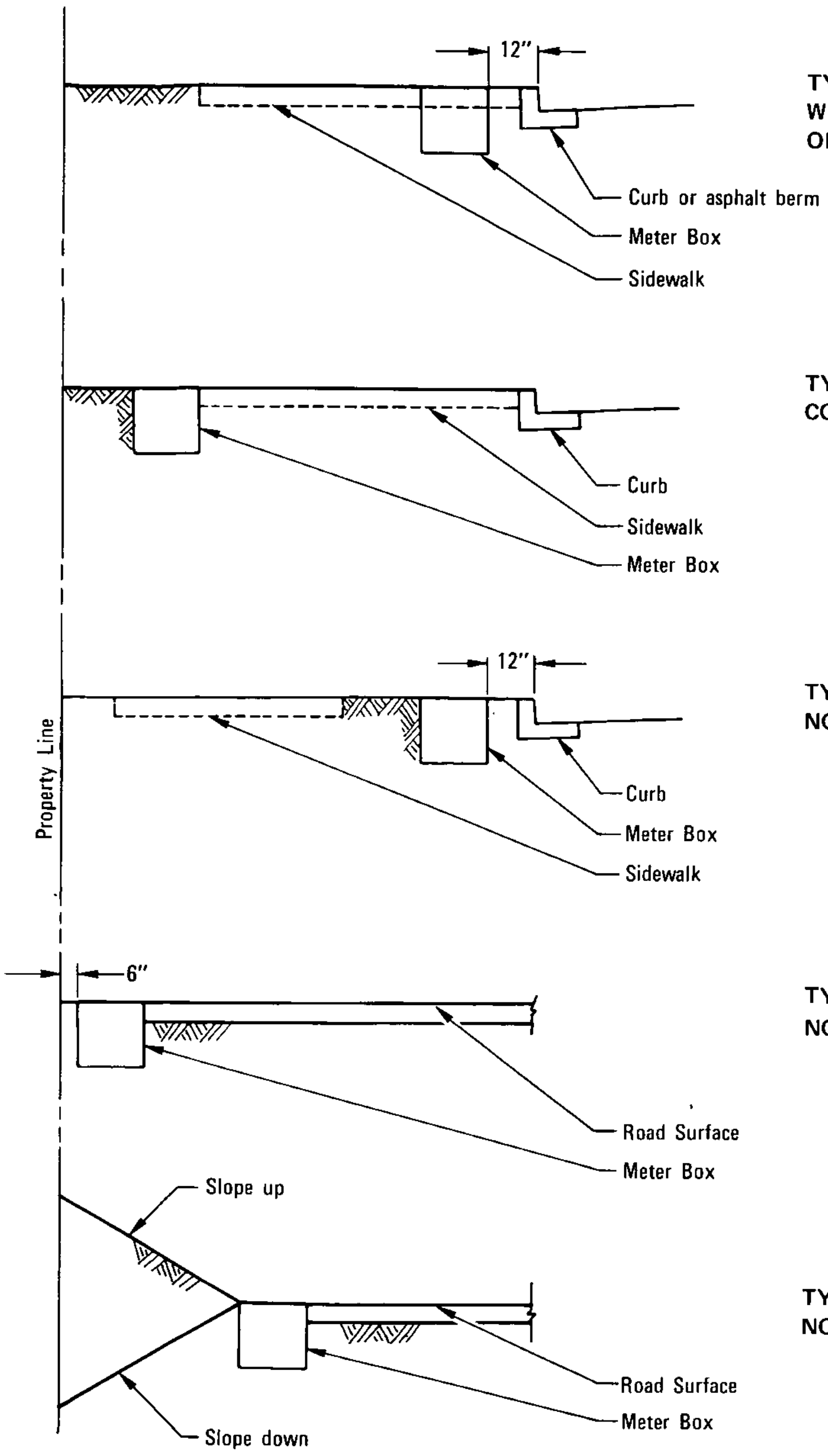
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **W-14**

SAN DIEGO REGIONAL STANDARD DRAWING

AIR AND VACUUM VALVE ENCLOSURES

Revision	By	Approved	Date



TYPE *A1
WITH OR WITHOUT COMMERCIAL OR RESIDENTIAL SIDEWALK

TYPE *A2
CONTIGUOUS SIDEWALK

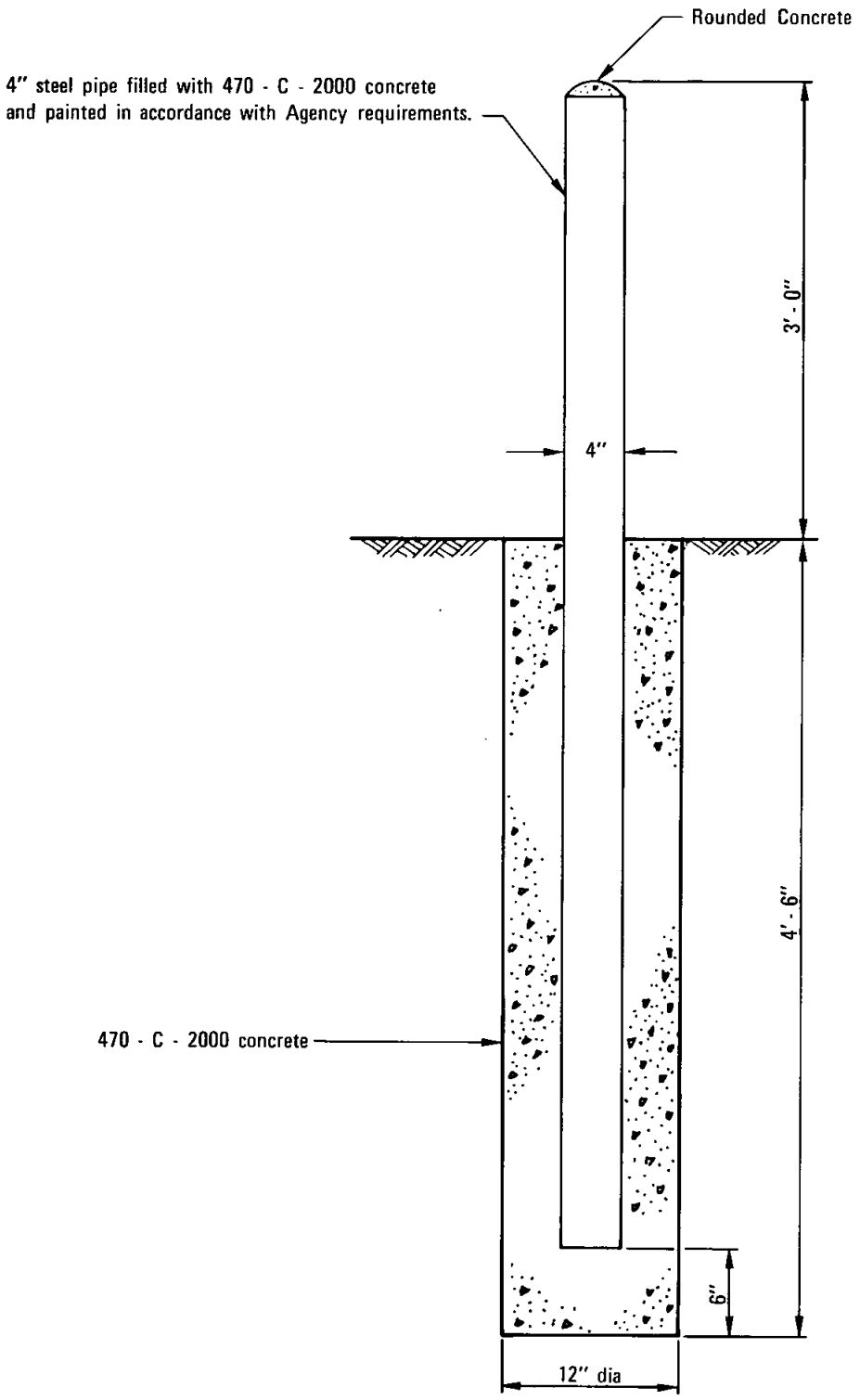
TYPE B
NON-CONTIGUOUS SIDEWALK

TYPE C
NO CURB

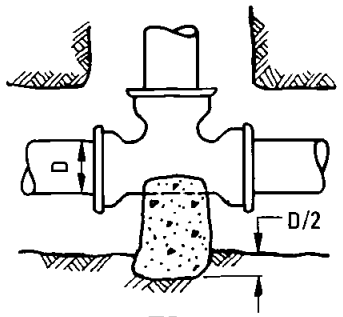
TYPE D
NO CURB

* Agency to determine alternate

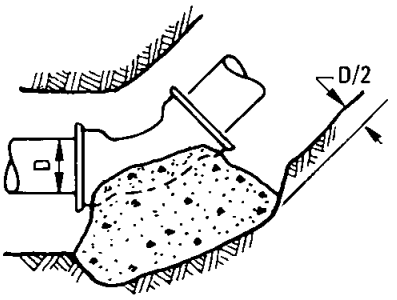
Revision	By	Approved	Date	SAN DIEGO REGIONAL STANDARD DRAWING	RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE
				METER BOX LOCATIONS	Allen A. Kerchem (signature) Dec. 1975 Coordinator R.C.E. 19807 Date
					DRAWING NUMBER **W-15**



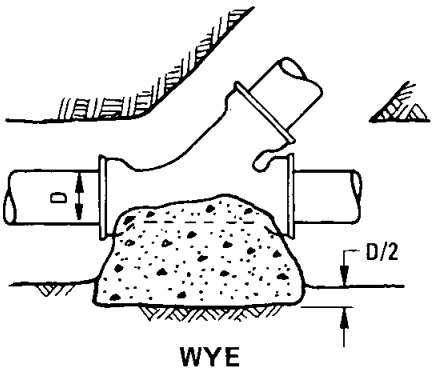
RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE Coordinator R.C.E. 19807 — Date: Dec. 1975	SAN DIEGO REGIONAL STANDARD DRAWING	Revision	By	Approved	Date
DRAWING NUMBER **W-16**	**PROTECTION POST**				



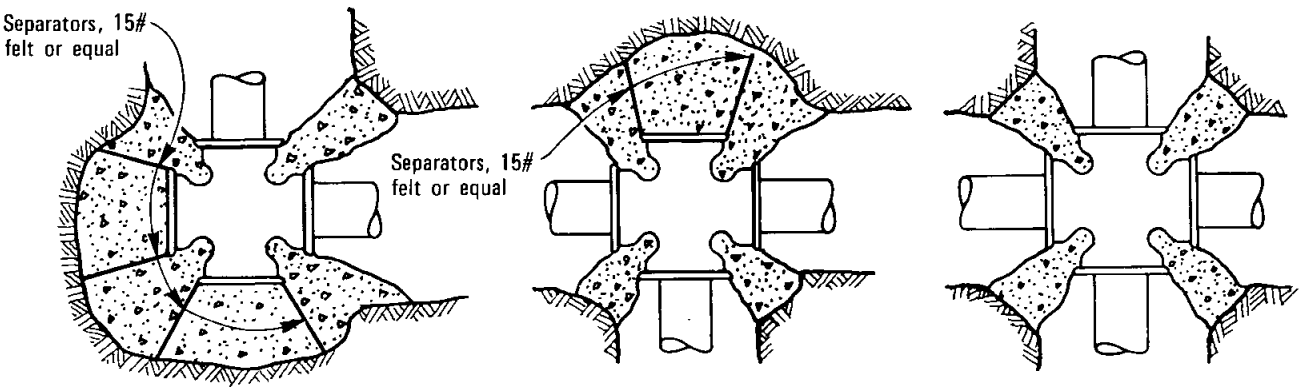
TEE



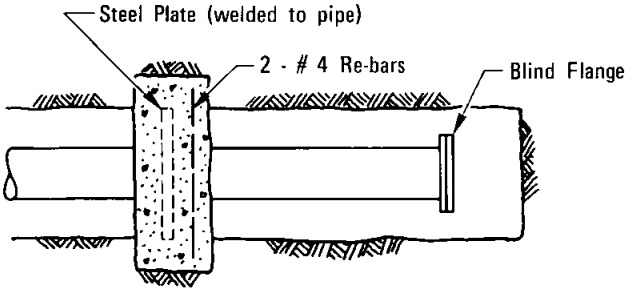
HORIZONTAL OR
VERTICAL BEND



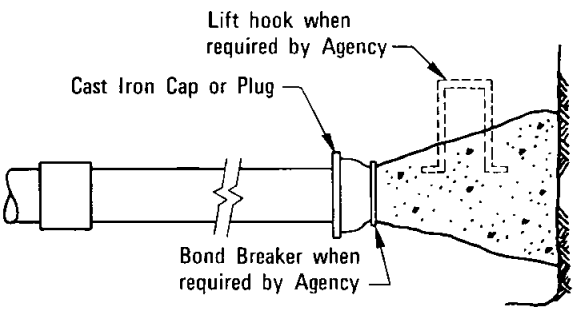
WYE



CROSS BLOCKING



STEEL PIPE
PLAN



A.C. PIPE
ELEVATION

DEAD END BLOCKING

NOTES

1. Concrete shall be 470 - C - 2000.
2. See Standard Drawing W-18 for bearing areas.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

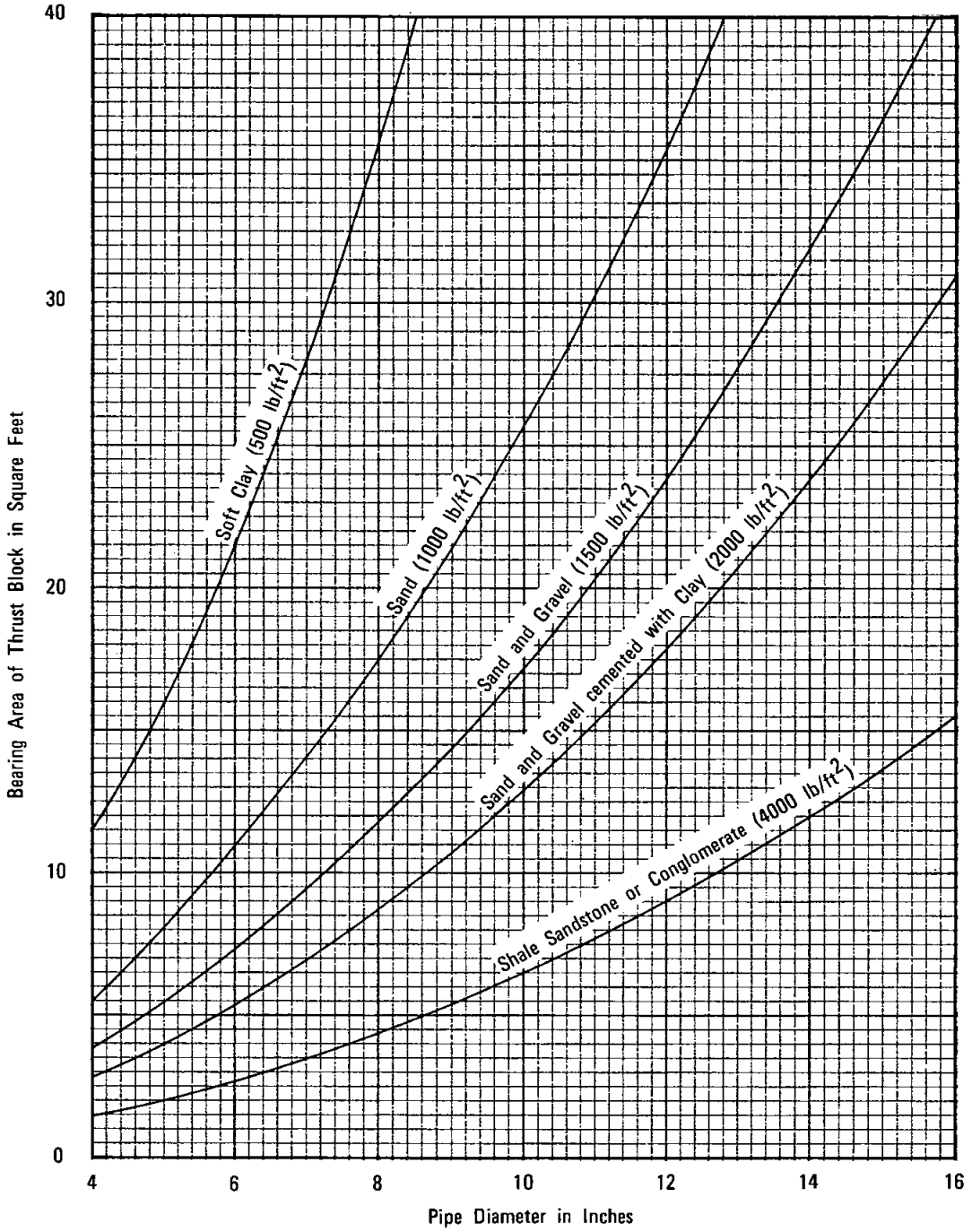
CONCRETE THRUST BLOCKS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kenkel — Coordinator R.C.E. 19807

Dec. 1975 — Date

DRAWING NUMBER **W-17**



NOTES

1. Based on 225 psi test pressure and bearing values of dry soils.
2. Values from curves are for tees and deadends, i.e.; straight line thrust.
   For 90° bend: 1.4 value from curve.
   For 45° bend: 0.8 value from curve.
   For 22 1/2° bend: 0.4 value from curve.
3. For conditions not covered by curves, special thrust blocks must be computed and approved.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

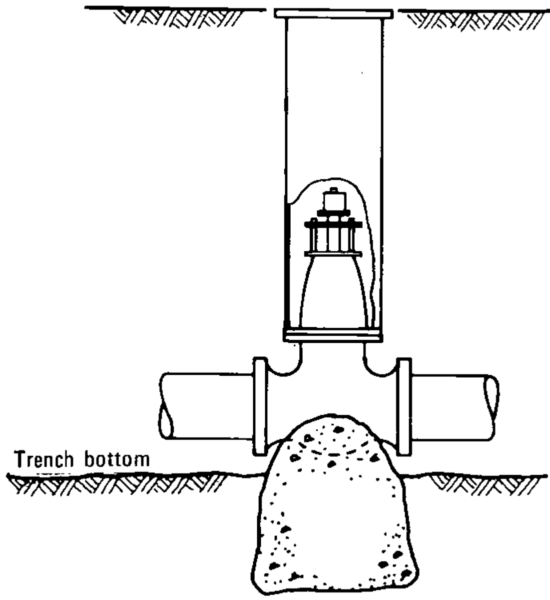
Allan A. Kershaw — Dec. 1975
Coordinator R.C.E. 19807 — Date

DRAWING NUMBER **W-18**

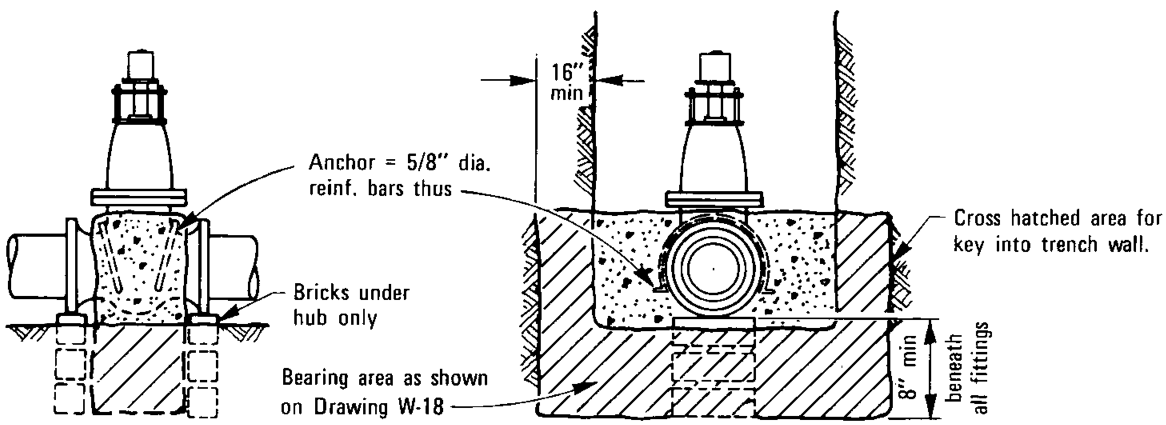
SAN DIEGO REGIONAL STANDARD DRAWING

THRUST BLOCK BEARING AREAS

Revision	By	Approved	Date



TYPE–A SUPPORT BLOCK



TYPE–B THRUST BLOCK

NOTE

Concrete shall be 470-C-2000.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

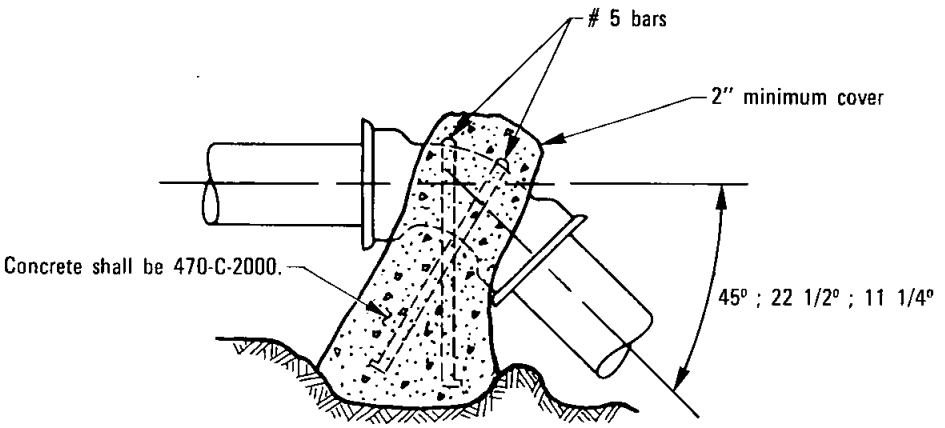
CONCRETE VALVE BLOCKING

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Albert A. Kirchhoff — Dec. 1975

Coordinator R.C.E. 19807 Date

DRAWING NUMBER **W-19**



Pipe Nominal Dia	Cubic Ft. Of Concrete Required per 100 P.S.I. Pressure*		
	45°	22 1/2°	11 1/4°
4	7	4	2
6	15	8	4
8	27	14	7
10	* *	21	11
12	* *	* *	16

* Increase volumes shown in proportion to pressures existing when pressure testing pipeline.

* * Special design required.

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allan A Kenkel Dec. 1975

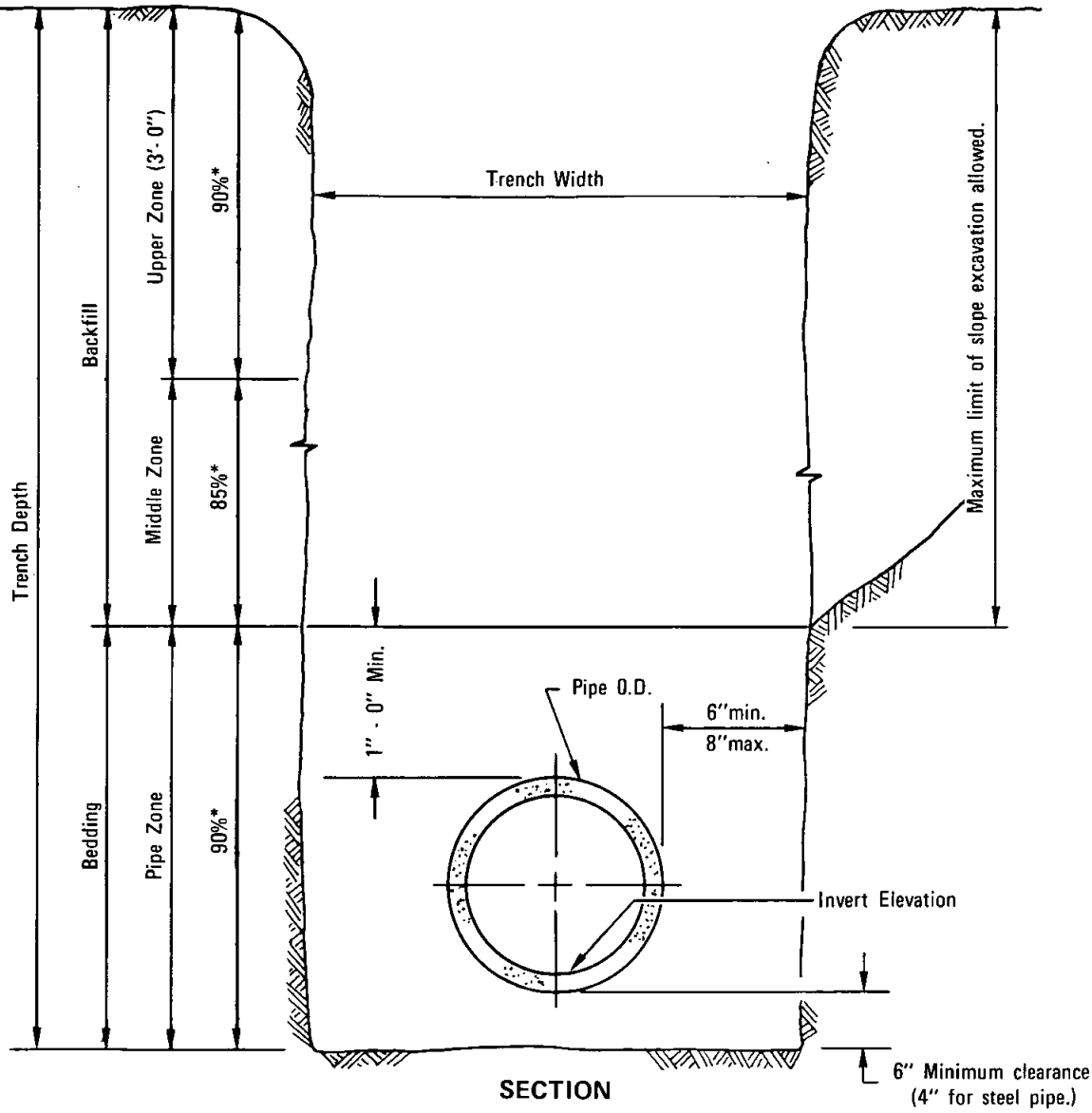
Coordinator R.C.E. 19807 Date

DRAWING NUMBER **W-20**

SAN DIEGO REGIONAL STANDARD DRAWING

ANCHOR BLOCK (VERTICAL BEND ONLY)

Revision	By	Approved	Date



SECTION

NOTES

1. For trenching on improved streets see standard drawing G-24 or G-25 for resurfacing details.
2. (*) indicates minimum relative compaction.

Revision	By	Approved	Date

SAN DIEGO REGIONAL STANDARD DRAWING

PIPE BEDDING AND TRENCH BACKFILL FOR WATER MAINS

RECOMMENDED BY THE SAN DIEGO REGIONAL STANDARDS COMMITTEE

Allen A Kercheval — Coordinator R.C.E. 19807

Dec. 1975 — Date

DRAWING NUMBER **W-21**